

**CANYON FUEL COMPANY, LLC  
DUGOUT CANYON MINE**

**C/007/039**

**PERMIT AREA EXPANSION**

**ADDITION OF ACREAGE TO FEDERAL LEASE U-07064-027821**

**AND**

**INCORPORATION OF SITLA LEASE ML-50582-OBA**

**OCTOBER 15, 2007**

**Canyon Fuel Company, LLC**  
**Dugout Canyon Mine**  
P.O. Box 1029  
Wellington, Utah 84542



October 15, 2007

RE: Pre-subsidence Survey – Addition of 487.57 Acres to Federal Lease U-07064-027821 and the addition of State Lease ML-50582-OBA (320 acres, more or less)  
Dugout Canyon Mine, Canyon Fuel Company, LLC, C/007/039, Carbon County, Utah

TO: Water Conservancy District, Richard N. Lee, PO Box 509, Helper, Utah 84526;

The following information is provided in accordance with requirement of Utah State Regulations R645-301-525.100, Pre-subsidence survey.

As clarification the definition of "renewable resource lands" as referenced in the following regulations has been provided per R645-100-200, Natural Resource: Oil, Gas and Mining; Coal, Administrative.

"Renewable Resource Lands" means aquifers and areas for the recharge of aquifers and other underground waters, areas for agricultural or silvicultural production of food and fiber, and grazing lands.

525.100 Pre-subsidence survey. Each application for UNDERGROUND COAL MINING AND RECLAMATION ACTIVITIES will include:

525.110 A map of the permit and adjacent areas at a scale of 1:12,000, or larger if determined necessary by the Division, showing the location and type of structures and renewable resource lands that subsidence may materially damage or for which the value or reasonably foreseeable use may be diminished by subsidence, and showing the location and type of State-appropriated water that could be contaminated, diminished, or interrupted by subsidence.

Maps currently within approved Dugout Canyon Mine, Mining and Reclamation Plan (M&RP): Maps are available for review at the Utah Division of Oil, Gas and Mining offices in Price and Salt Lake City, Utah, addresses listed below.

#### Plates

- 1-1 Surface Ownership
- 1-2 Coal Ownership
- 1-4 Dugout Canyon Mine Permit Area
- 2-1 Native Soil Types Present in Dugout Canyon Mine Permit Area
- 3-1 Vegetation
- 3-1E Pace Canyon Fan Vegetation and Reference Area
- 4-1 Land Uses
- 5-7 Proposed Mine Sequence and Planned Subsidence Boundary
- 7-1 Hydrologic Monitoring Stations

SUFCO Mines



#### File in:

☐ Confidential

☐ Shelf

☒ Expandable

Refer to Record No. 0067 Date 10-22-07

In C/0070039, 2007, Incoming

For additional information



Dugout / Soldier Canyon Mines

## 7-2 Water Rights

The following plates are located in Appendix 5-10

PC 5-2 Pace Canyon Fan Surface Facilities and Cross-Sections

PC 5-4 Pace Canyon Fan Existing Surface Topography

A drawing showing the proposed mining plan for 2007 - 2011 is attached to this letter.

525.120 A narrative indicating whether subsidence, if it occurred, could cause material damage to or diminish the value or reasonably foreseeable use of such structures or renewable resource lands or could contaminate, diminish, or interrupt State-appropriated water supplies.

Information to address subsidence is provided in Sections 332, 521, 525, 531, 623, 625, 632, 642, 727 and 830 of the Dugout Canyon Mine M&RP.

To the best of the knowledge of Canyon Fuel Company, LLC – Dugout Canyon Mine and according to aerial photographs (November 2006) taken of the area and a walking inventory by archeologists of T. 13 S., R. 13 E., SLBM, Utah, Section 17, 18 and 21 proposed for addition to the federal lease and Section 16 a State Lease, the only structures are a fence line between Sections 17 and 18 along a two track and a fence line along the edge of a canyon in Sections 16 and 17. There are also two unmapped roads one is in Section 16 and one is in Section 18. Adjacent to the unmapped road in Section 16 there is a salt lick. Section 16 is under a SITLA lease with both the coal and surface being owned by SITLA.

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Section 727 of the M&RP provides a description of the measures to be taken to replace adversely affected State-appropriated water supplies or to mitigate or remedy any subsidence-related material damage to the land.

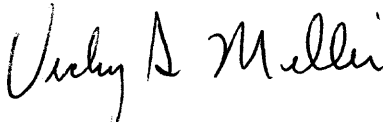
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To the best of the knowledge of Canyon Fuel Company, LLC – Dugout Canyon Mine, there is no non-commercial buildings, occupied residential dwellings and structures related thereto, which may be diminished by subsidence, within the area encompassed by the applicable angle of draw associated with the proposed area to be added in association with a federal lease modification.

A survey of the quantity and quality of all State-appropriated water supplies within the permit area and adjacent area is provided in Chapter 7 of the M&RP, the UDOGM water database at [www.ogm.utah.gov](http://www.ogm.utah.gov), water rights at the Division of Water Rights office in Salt Lake City or the State Engineers office in Price.

If you require additional information or have information to be added to this survey, please call me at (435) 636-2869.

Sincerely yours,



Vicky S. Miller

cc: Dave Spillman, with attachments  
Pamela Grubaugh-Littig, w/o attachments



**Canyon Fuel Company, LLC**  
**Dugout Canyon Mine**  
P.O. Box 1029  
Wellington, Utah 84542



October 15, 2007

Gil L. Conover  
450 So. State  
Ferron, UT 84523

RE: Pre-subsidence Survey – Addition of 487.57 acres to Federal Lease U-07064-027821  
Dugout Canyon Mine, Canyon Fuel Company, LLC, C/007/039, Carbon County, Utah

Dear Mr. Conover;

The following information is provided in accordance with requirement of Utah State Regulations R645-301-525.100, Pre-subsidence survey.

As clarification the definition of "renewable resource lands" as referenced in the following regulations has been provided per R645-100-200, Natural Resource: Oil, Gas and Mining; Coal, Administrative.

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Maps currently within approved Dugout Canyon Mine, Mining and Reclamation Plan (M&RP): Maps are available for review at the Utah Division of Oil, Gas and Mining offices in Price and Salt Lake City, Utah.

#### Plates

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- 1-2 Coal Ownership
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- 3-1 Vegetation
- 3-1E Pace Canyon Fan Vegetation and Reference Area

- 4-1 Land Uses
- 5-7 Proposed Mine Sequence and Planned Subsidence Boundary
- 7-1 Hydrologic Monitoring Stations
- 7-2 Water Rights

The following plates are located in Appendix 5-10

PC 5-2 Pace Canyon Fan Surface Facilities and Cross-Sections

PC 5-4 Pace Canyon Fan Existing Surface Topography

A drawing showing the proposed mining plan for 2007 – 2011 is attached to this letter.

525.120 A narrative indicating whether subsidence, if it occurred, could cause material damage to or diminish the value or reasonably foreseeable use of such structures or renewable resource lands or could contaminate, diminish, or interrupt State-appropriated water supplies.

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To the best of the knowledge of Canyon Fuel Company, LLC – Dugout Canyon Mine and according to aerial photographs (November 2006) taken of the area and a walking inventory by archeologists (T. 13 S., R. 13 E., SLBM, Utah, Section 17, 18 and 21) proposed for addition to the federal lease, the only structures are a fence line between Sections 17 and 18 along a two track and a fence line along the edge of a canyon in Sections 16 and 17. There are also two unmapped roads one is in Section 16 and one is in Section 18. Adjacent to the unmapped road in Section 16 there is a salt lick. Section 16 is under a SITLA lease with both the coal and surface being owned by SITLA.

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To the best of the knowledge of Canyon Fuel Company, LLC – Dugout Canyon Mine, there is no non-commercial buildings, occupied residential dwellings and structures related thereto, which may be diminished by subsidence, within the area encompassed by the applicable angle of draw associated with the proposed area to be added in association with a federal lease modification.

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If you require additional information or have information to be added to this survey, please call me at (435) 636-2869.

Sincerely yours,

A handwritten signature in cursive script that reads "Vicky S. Miller".

Vicky S. Miller

cc: Dave Spillman, with attachments  
Pamela Grubaugh-Littig, w/o attachments

**Canyon Fuel Company, LLC**  
**Dugout Canyon Mine**  
P.O. Box 1029  
Wellington, Utah 84542



October 15, 2007

John Blake  
SITLA  
675 East 500 South, Suite 500  
Salt Lake City, UT 84102

RE: Pre-subsidence Survey – Addition of SITLA Lease ML-50582-OBA  
Dugout Canyon Mine, Canyon Fuel Company, LLC, C/007/039, Carbon County, Utah

Dear Mr. Blake;

The following information is provided in accordance with requirement of Utah State Regulations R645-301-525.100, Pre-subsidence survey.

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Vicky S. Miller

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Pamela Grubaugh-Littig, w/o attachments

**Canyon Fuel Company, LLC**  
**Dugout Canyon Mine**  
P.O. Box 1029  
Wellington, Utah 84542



October 15, 2007

Milton & Ardith Thayn Trust  
Sunnyside Star Route  
Price, Utah 84501  
C/O David Thayn

RE: Pre-subsidence Survey – Addition of 487.57 acres to Federal Lease U-07064-027821  
Dugout Canyon Mine, Canyon Fuel Company, LLC, C/007/039, Carbon County, Utah

Dear Mr. Thayn;

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**Canyon Fuel Company, LLC**  
**Dugout Canyon Mine**  
P.O. Box 1029  
Wellington, Utah 84542



October 15, 2007

Milton & Ardith Thayn Trust  
C/O David Thayn  
7732 East US Highway 6  
Wellington, UT 84542

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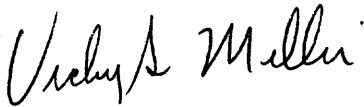
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If you require additional information or have information to be added to this survey, please call me at (435) 636-2869.

Sincerely yours,



Vicky S. Miller

cc: Dave Spillman, with attachments  
Pamela Grubaugh-Littig, w/o attachments

## CHAPTER 1

### LEGAL, FINANCIAL, COMPLIANCE AND RELATED INFORMATION

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**CHAPTER 1**  
**LEGAL, FINANCIAL, COMPLIANCE AND RELATED INFORMATION**

**110 MINIMUM REQUIREMENTS FOR LEGAL, FINANCIAL, COMPLIANCE AND RELATED INFORMATION**

**111 Introduction**

For information pertaining to this section(s) refer to General Chapter 1 binder for Canyon Fuel Company, LLC prepared for the Dugout Canyon Mine, Soldier Canyon Mine and Banning Loadout operations.

**112 Identification of Interests**

**112.100 Business Entity**

The Dugout underground coal mining operation is located in Carbon County, Utah. The surface facilities for the Dugout Canyon Mine are within Section 23, Township 13 South, Range 12 East, SLBM approximately 11 miles northeast of Wellington, Utah.

For addition information refer to General Chapter 1 binder for Canyon Fuel Company, LLC Dugout Canyon Mine, Soldier Canyon Mine and Banning Loadout operations.

**112.200 Applicant and Operator**

For information pertaining to this section refer to General Chapter 1 binder for Canyon Fuel Company, LLC prepared for Dugout Canyon Mine, Soldier Canyon Mine and Banning Loadout operations.

### 112.300 Officers of the Applicant

For information pertaining to this section refer to General Chapter 1 binder for Canyon Fuel Company, LLC prepared for Dugout Canyon Mine, Soldier Canyon Mine and Banning Loadout operations.

### 112.400 Coal Mining and Reclamation Operation Owned or Controlled

The following list describes all permits held by Canyon Fuel Company, LLC, all pending applications for permits, and any permit recognized as necessary in the future for which no application has been filed. Identification numbers of applications or permits are contained in the following list. Many of the agencies listed, however, have review responsibility only and may not have submitted a numbered permit.

<u>Permit</u>	<u>Issuing Authority</u>	<u>Approval Status/ Identification No.</u>
Mining and Reclamation Permit C/007/039	State of Utah Department of Natural Resources Division of Oil, Gas and Mining  Department of Interior U.S. Geological Survey and Office of Surface Mining  Department of Agriculture U.S. Forest Service Manti La Sal National Forest	Approved
U.P.D.E.S. Permit UTG-040020/UT0025593	Environmental Protection Agency and Utah D.E.Q.	Approved
Business License	Carbon County	Approved
Mine Health and Safety Permits 42-01890 and 42-01888, 1211-UT-09-01890-01	Mine Safety and Health Administration - Utah	Approved

Canyon Fuel Company, LLC  
SCM/Dugout Canyon Mine

Mining and Reclamation Plan  
October 15, 2007 ~~August 28, 2007~~

Radio Permits	Federal Communications Commission	Approved
Certificate of Insurance and Authorization to do Business in State	State Industrial Development Commission	Approved
Road Agreement	Carbon County	Approved
Air Quality Approval Order	State of Utah Utah Air Conservation Committee Department of Health Division of Environmental Health	Approved
Stream Channel Alteration Permit	State Engineer	Approved

The Canyon Coal Company, LLC mining permits and operations are:

SUFCO Mine	C/041/002
Skyline Mine	C/007/005
Soldier Canyon Mine	C/007/018
Banning Loadout	C/007/034
Dugout Canyon Mine	C/007/039

The issuing authority for the Canyon Fuel Company permits is the UDOGM.

Operations held by subsidiary companies of Arch Coal, Inc. and corporate structure are presented on Figure 1-1 in the General Chapter 1 for Canyon Fuel Company, LLC. Facility names, mailing addresses and permit numbers for these operations are provided in either Table 1-1 and/or Table 1-2. For additional information refer to the General Chapter 1 binder for Canyon Fuel Company, LLC prepared for the Dugout Canyon Mine, Soldier Canyon Mine and Banning Loadout operations.



### **112.500 Legal or Equitable Owner of the Surface and Mineral Properties**

The legal and equitable owners of the surface and mineral properties to be affected by this mining operation during the duration of the permit period are the State of Utah, Bureau of Land Management and Canyon Fuel Company, LLC. Refer to Refuse Pile Amendment for additional ownership information.

Canyon Fuel Company, LLC  
6955 South Union Park Center  
Suite 540  
Salt Lake City, UT 84047  
Telephone: (801)569-4700

Milton & Ardith Thayne Trust  
Sunnyside Star Route  
Price, Utah 84501

State of Utah  
School and Institutional  
Trust Lands Administration  
675 East 500 South  
Salt Lake City, Utah 84102-2818

George & Alice Conover Etal  
2701 Georgia Way  
Sandy, Utah 84092

United States of America  
Department of Interior  
Bureau of Land Management  
Price Coal Office  
125 South 600 West  
Price, Utah 84501

Gil L. Conover  
450 So. State  
Ferron, Utah 84523

No area within the lands to be affected by surface operations and facilities or within the area of coal to be mined is under a real estate contract.

Coal mining and reclamation operations are listed on Table 1-1 and the corporate structures is presented on Figure 1-1 in the General Chapter 1 binder.

### **112.600 Owners of Record of Property Contiguous to Proposed Permit Area**

Owners of record for surface and mineral properties contiguous to the proposed permit area are shown on Plate 1-1 and 1-2, with the names and addresses listed below.

Canyon Fuel Company, LLC  
SCM/Dugout Canyon Mine

Mining and Reclamation Plan  
~~October 15, 2007~~ August 28, 2007

United States of America  
Department of Interior  
Bureau of Land Management  
Price Coal Office  
125 South 600 West  
Price, Utah 84501

Gil L. Conover  
450 So. State  
Ferron, Utah 84523

State of Utah  
School and Institutional Trust Lands Admin.  
675 East 500 South  
Salt Lake City, Utah 84102-2818

J. George Conover  
275 West Main  
Ferron, Utah 84523

KFJ Ranch Partnership  
C/O Kerwin Jensen  
Cleveland, Utah 84518

George & Alice Conover Et.al.  
2701 Georgia Way  
Sandy, Utah 84092

Milton & Ardith Thayn Trust  
Sunnyside Star Route  
Price, Utah 84501

Surface ownership along the county road is shown on Plate 1-3. In addition refer to the Refuse Pile Amendment for additional information.

#### **112.700 MSHA Numbers**

The Dugout Canyon Mine MSHA numbers are:

MSHA No. 42-01890 Rock Canyon seam (west side of canyon)

MSHA No. 42-01888 Gilson seam (west side of canyon)

MSHA No. 1211-UT-09-01890-01 Dugout Canyon Mine Refuse Pile

### **112.800 Interest in Contiguous Lands**

A State Institutional Trust Lands coal tract is contiguous to the east of the Dugout Canyon Mine permit boundary. Upon approval by UDOGM, Canyon Fuel Company, LLC intends to begin mining the coal reserves in this lease during the current term of this permit application.

### **112.900 Certification of Submitted Information**

Canyon Fuel Company, LLC hereby attests that the information contained in this permit document is true and correct to the best of their knowledge.

### **113 Violation Information**

For violation information refer to Table 1-2 in the General Chapter 1 binder for Canyon Fuel Company, LLC prepared for the Dugout Canyon Mine, Soldier Canyon Mine and Banning Loadout operations.

### **114 Right-of-Entry Information**

The right to enter the leaseholds conveyed by the State coal leases is conferred to the lessee by the Mineral Leasing Act of 1920 and the leases themselves. Copies of State coal leases ML-42648 and ML-42649, and Federal Lease U07064-027821 which grant CFC the right to enter and conduct underground mining operations, are presented in Appendix 1-1.

The legal description of the CFC leases is:

State Lease ML-42648 - (3640 acres) - Approved

T. 13 S., R. 12 E., SLBM, Utah

Section 8: E1/2

Section 10: S1/2

Section 11: S1/2

Sections 14 and 15: All

Section 17: NE1/4; E1/2SW1/4; SE1/4

Section 20: E1/2NW1/4; SW1/4NW1/4; N1/2NE1/4

Section 21: N1/2NW1/4; NE1/4

Section 22: N1/2; N1/2S1/2

Section 23: W1/2NW1/4

State Lease ML-42649 - (2212 acres) - Approved

T. 13 S., R. 12 E., SLBM, Utah

Section 3: Lots 1, 2, 3, 4, S1/2 (all)

Section 4: Lots 1, 2, 3, 4, S1/2 (all)

Section 5: Lots 1, 2, SE1/4

Section 9: All

Section 10: N1/2

Section 11: N1/2

Federal Coal Lease U-07064-027821 - (~~2,456.14~~ 2,903.71 acres) - Approved 1 January 1957,  
Expanded 2007

T. 13 S., R. 12 E., SLBM, Utah

Section 13: S1/2

Section 23: E1/2E1/2, W1/2SE1/4, NE1/4SW1/4

Section 24: All

Section 25: N1/2N1/2

Section 26: N1/2NE1/4

T. 13 S., R. 13 E., SLBM, Utah

Section 17: S1/2N1/2, N1/2SE1/4, E1/2SE1/4, SE1/4SE1/4

Section 18: Lots 2, 3, 4, E1/2SW1/4; SE1/4, S1/2NE1/4, SE1/4NW1/4

Section 19: Lots 1-4, E1/2W1/2, NE1/4, NW1/4SE1/4

Section 21: NW1/4NW1/4

Section 30: Lot 1

Federal BLM Right-of-Way UTU-76601 - (10 acres) - Sept. 1998

T. 13S., R. 12 E., SLBM, Utah

Section 23: NE1/4NW1/4NW1/4SW1/4, N1/2NE1/4NW1/4SW1/4,  
SE1/4NW1/4NW1/4SW1/4

Fee land owned by CFC as described below: (800 acres)

T. 13 S., R. 12 E., SLBM, Utah

Section 16: All

Section 23: E1/2NW1/4; W1/2NE1/4

BLM Rt-of-Way UTU-77985 - (57.5 acres)

T13 S., R12E., SLBM, Utah

Section: 22: NE1/4SW1/4SW1/4SE1/4, S1/2SW1/4SW1/4SE1/4,  
N1/2SE1/4SW1/4SE1/4, SE1/4NE1/4SW1/4SE1/4,  
S1/2NW1/4SE1/4SE1/4, SW1/4NE1/4SE1/4SE1/4,  
N1/2NE1/4SE1/4SE1/4

Section 23: NW1/4SW1/4NW1/4SW1/4, S1/2NW1/4NW1/4SW1/4,  
NE1/4NW1/4NW1/4SW1/4, N1/2NE1/4NW1/4SW1/4

Section 27: NE1/4SE1/4NE1/4NW1/4, S1/2SE1/4NE1/4NW1/4,  
SE1/4NE1/4NE1/4NW 1/4, W1/2 NW1/4NW1/4NE1/4

BLM Parcel (2.5 acres)

T13 S., R12E., SLBM, Utah

Section: 23: NW1/4NW1/4NW1/4SW1/4

State Lease ML-48435-OBA - (2,560 acres)

T13 S., R13 E., SLBM, Utah

Section 17: W1/2W1/2SW1/4, W1/2E1/2W1/2SW1/4

Section 19: NE1/4SE1/4, S1/2SE1/4

Section 20: W1/2W1/2W1/2, W1/2E1/2W1/2W1/2

T13 S., R13 E., SLBM, Utah (Added to Permit Area in 2005, approximately 2,360 acres)

Section 17: E1/2SW1/4, SW1/4SE1/4, E1/2E1/2W1/2SW1/4

Section 20: E1/2W1/2, E1/2, E1/2E1/2W1/2W1/2

Section 21: SW1/4NW1/4, SW1/4

Section 28: NW1/4, N1/2SW1/4, SW1/4SW1/4

Section 29: All

Section 30: E1/2, E1/2W1/2

State Lease ML-50582-OBA - (320 acres)

T13 S., R13 E., SLBM, Utah

Section 16: W1/2

#### Waste Rock Storage Facility

T. 14 S., R. 12 E., SLBM, Utah (Approximately 26.8 acres)

Section 18: Portions of NE1/4, SW1/4 and SE1/4 of the NE1/4

All of Lease ML-42648, except the E1/2 of Section 8 and the NE1/4 of Section 17, is included within the Dugout Canyon Mine permit boundary. However, only the S1/2 SE1/4 of Section 9 from Lease ML-42649 is within the permit boundary. The ten acres described in UTU-76601 are also described in UTU-77985. The U.S. Department of Interior, Bureau of Land Management (BLM) right-of-way application UTU-76601 is included in Appendix 1-3.

The disturbed area encompasses 20.80 acres (Mine Facility area, including Gilson well pad and small substation), 30.4 acres (G-2, G-3, G-4, G-5, G-6, G-7, G-9, G-10, G-11, G-12, G-13, G-14, G-15, G-16, G-17, G-18, G-19 and G-31 Degas Well), 14.25 acres (AMV Road) 0.85 (Topsoil Stockpile), 1.8 acres (Leach field/pipeline area), 2.7 acres (Pace Canyon Fan Facility) and 26.8 acres (Refuse Pile area) totaling approximately 97.6 acres. That acreage includes a pre- and post mining road with an area of 1.6 acres and 2.03 acres of undisturbed land within the mine facilities disturbed area and 11.2 acres within the refuse pile disturbed area.

The permit boundary encompasses approximately ~~9,544~~ 10,071 acres which includes the following surface ownership and acreage: 10 acres in the BLM right-of-way, approximately 567 acres of other

federal lands, ~~920~~ 1,240 acres of state lands, and fee acreage of approximately ~~8,014~~ 8,254 acres (Plate 1-1 and RA Plate 1-1).

Coal ownership acreage within the permit area includes approximately ~~2,844~~ 3,284 acres of federal coal, approximately ~~5,840~~ 5,960 acres of state coal, and 827 acres of fee coal (Plate 1-2 and RA1-1B). Approximately 745 acres which include the surface subsidence area, refuse pile and leach field areas will not be mined although their acreage is included in the surface and coal ownership acreage totals.

A legal description of the permit boundary includes:

T. 13 S., R. 12 E., SLBM, Utah

- Section 9: S1/2SE1/4
- Section 10: S1/2
- Section 11: S1/2
- Section 13: All except N1/2N1/2
- Section 14: All
- Section 15: All
- Section 16: All
- Section 17: E1/2SW1/4; SE1/4
- Section 20: E1/2NW1/4; SW1/4NW1/4; N1/2NE1/4
- Section 21: N1/2NW1/4; NE1/4
- Section 22: N1/2; N1/2S1/2; Portion of N1/2NE1/4SE1/4SE1/4;  
Portion of SW1/4NE1/4SE1/4SE1/4;  
Portion of the S1/2NW1/4SE1/4SE1/4;  
Portion of SW1/4NE1/4SW1/4SE1/4;  
Portion of N1/2SE1/4SW1/4SE1/4;  
Portion of NE1/4SW1/4SW1/4SE1/4;  
Portion of S1/2SW1/4SW1/4SE1/4
- Section 23: NW1/4; NE1/4; SE1/4; NE1/4SW1/4; NW1/4NW1/4SW1/4;  
S1/2NE1/4NW1/4SW1/4; NW1/4SW1/4NW1/4SW1/4
- Section 24: All
- Section 25: N1/2N1/2
- Section 26: N1/2NE1/4

Section 27: Portion of W1/2NW1/4NW1/4NE1/4  
Portion of SW1/4NE1/4NE1/4NW1/4  
Portion of E1/2SW1/4NE1/4NW1/4  
Portion of SW1/4SW1/4NE1/4NW1/4

T. 13 S., R. 13 E., SLBM, Utah

Section 16 W1/2  
Section 17 All except N1/2N1/2 ~~SW1/4; SW1/4NW1/4; SW1/4SE1/4~~  
Section 18 All except N1/2N1/2  
Section 19 All  
Section 20 All  
Section 21 SW1/4; SW1/4NW1/4; NW1/4NW1/4  
Section 28 NW1/4; N1/2SW1/4; SW1/4SW1/4  
Section 29 All  
Section 30 NW1/4NW1/4; E1/2; E1/2W1/2

T. 14 S., R. 12 E., SLBM, Utah

Section 18 Portion N1/2NE1/4

Topsoil is being stored in T14S, R12E, Section 8, a storage area permitted to Soldier Canyon Mine. See Chapter 2 for additional details concerning the topsoil storage.

As clarification, in 2007 acreage (487.57 acres) was added to existing Federal Coal Lease U-07064-027821, two hundred and forty-seven acres of this added acreage is already included as part of the Dugout permitted area. Acreage was previously added to the permit area in excess of the Federal leased acreage to act as a subsidence buffer zone (207 acres) and to accommodate a revised mine plan (40 acres). In addition, State Lease ML-50582-OBA (320 acres, more or less) was issued to Dugout Canyon Mine in 2007. Future surface disturbance of these leases will be permitted as needed to facilitate mining activities. ~~Acreage has been previously added to the permit area which is in excess of the Federal lease acreage to act as a~~ The subsidence buffer zone. ~~This acreage has been~~ was added in T13S, R12E Section 13 and T13S, R13E Sections 17 and 18. The acreage added in T13S, R13E Sections 17 and 18 is now part of Federal Coal Lease U-07064-027821.



The refuse pile is located on property owned by Canyon Fuel Company, LLC. The property is located approximately 6.5 miles southwest of the Dugout Canyon Mine in portions of the NE1/4, SW 1/4 and SE 1/4 of the NE 1/4, in a portion of the NW 1/4 of the SE1/4, and in the NW1/4 of the NE 1/4 of Section 18, Township 14 South, Range 12 East, Salt Lake Base Meridian.

BLM Right-of-Way UTU-77985 grants the right-of-entry for the leach field and associated pipeline. Refer to the right-of-way description above.

#### **115 Status of Unsuitability Claims**

To the best knowledge of Canyon Fuel Company, LLC, no portion of the area to be permitted is designated, or under study for being designated, unsuitable for mining.

CFC does not propose to conduct coal mining or reclamation operations within 300 feet of any occupied dwelling. A description of operations to be conducted within 100 feet of a public road is provided in Chapter 5 of this M&RP, together with a discussion of plans to protect the interests of the public.

#### **116 Permit Term**

The anticipated mining progression during operation of the Dugout Canyon Mine is outlined on Plate 5-7. Rates of production for the permit term are presented in Section 523. Reclamation operations are discussed in Chapters 2, 3, 5, 7, and 8.

#### **117 Insurance, Proof of Publication, and Facilities and Structures Used in Common**

Certificates of Insurance issued to Canyon Fuel Company, LLC are located in General Chapter 1 binder for Canyon Fuel Company, LLC Dugout Canyon Mine, Soldier Canyon Mine and Banning Loadout operations.

The newspaper advertisement and the verification of the advertisement appearing in the appropriate newspapers are included in Appendix 1-2.

#### **118 Filing Fee**

The permit application was accompanied by a \$5.00 filing fee. UDOGM retains a record of filing fee payments in their office in Salt Lake City, Utah.

#### **120 PERMIT APPLICATION FORMAT AND CONTENTS**

This permit application will comply with R645-301-120.

#### **130 REPORTING OF TECHNICAL DATA**

All technical data submitted in the permit application will be accompanied by the name or organization responsible for the collection and analysis of data, dates of collection and descriptions of methodology used. Technical analyses will be planned by or under the direction of a qualified professional in the subject to be analyzed.

#### **140 MAPS AND PLANS**

The maps and plans in the Mining and Reclamation Plan will correspond with the requirements in R645-301-140.

Canyon Fuel Company, LLC  
SCM/Dugout Canyon Mine

Mining and Reclamation Plan  
October 15, 2007 ~~August 28, 2007~~

## **150 COMPLETENESS**

CFC believes the information in this permit application to be complete and correct.

Canyon Fuel Company, LLC  
SCM/Dugout Canyon Mine

Mining and Reclamation Plan  
~~October 15, 2007~~ August 28, 2007

## **APPENDIX 1-1**

Coal Lease Documents

GRANT: SCH

**UTAH STATE LEASE FOR COAL**  
**ML 50582-OBA**  
**(Dugout Canyon Mine Deep-Cover Extension)**

THIS COAL MINING LEASE AND AGREEMENT (the "Lease") is entered into and executed in duplicate as of February 1, 2007 (the "Effective Date") by and between the STATE OF UTAH, acting by and through the SCHOOL AND INSTITUTIONAL TRUST LANDS ADMINISTRATION, 675 East 500 South, Suite 500, Salt Lake City, Utah 84102 ("Lessor"), and

ARK LAND COMPANY  
CITYPLACE ONE, SUITE 300  
ST. LOUIS, MO 63141

having a business address as shown above ("Lessee").

**WITNESSETH:**

That the State of Utah, as Lessor, in consideration of the rentals, royalties, and other financial consideration paid or required to be paid by Lessee, and the covenants of Lessee set forth below, does hereby GRANT AND LEASE to Lessee the exclusive right and privilege to explore for, drill for, mine, remove, transport, convey, cross-haul, commingle, and sell the coal located within the boundaries of the following-described tract of land (the "Leased Premises") located in Carbon County, State of Utah:

T13S, R13E, SLB&M.  
Sec. 16: W½

Containing 320.00 acres, more or less.

Together with the right and privilege to make use of the surface (but only to the extent owned by Lessor) and subsurface of the Leased Premises for uses incident to the mining of coal by Lessee on the Leased Premises or on other lands under the control of Lessee or mined in connection with operations on the Leased Premises, including, but not limited to, conveying, storing, loading, hauling, commingling, cross-hauling, and otherwise transporting coal; excavating; removing, stockpiling, depositing and redepositing of surface materials; and the subsidence, mitigation, restoration and reclamation of the surface.

This Coal Mining Lease and Agreement is subject to, and Lessee hereby agrees to and accepts, the following covenants, terms, and conditions:

1. LEASED MINERALS.

- 1.1 Coal. This mineral lease covers coal, which shall mean and include black or brownish-black solid fossil fuels that have been subjected to the natural processes of coalification, and which fall within the classification of coal by rank as anthracitic, bituminous, sub-bituminous, or lignitic, together with closely associated substances which include, but are not limited to other hydrocarbon substances physically contained within the same geologic strata as the coal. In the event that minerals other than coal are discovered during lease operations, Lessee shall promptly notify Lessor.
- 1.2 Coalbed Methane. To the extent that Lessor owns gas, coalbed methane or coal seam gas (collectively "coalbed methane") within the Leased Premises, Lessee may remove, vent, flare or capture such coalbed methane from the coal strata being mined and any overlying formations if such removal is necessary for safety reasons in the reasonable discretion of Lessee. If Lessee captures or uses such coalbed methane, it shall pay Lessor royalties on the value of such coalbed methane at the prevailing state royalty rate for

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natural gas, unless such royalties are expressly waived by Lessor. In the event that Lessor does not own coalbed methane within the Leased Premises, Lessee must obtain the consent of the owner of such coalbed methane prior to removal or capture of such gas. Except as expressly granted herein, the right to extract gas, coalbed methane and coal seam gas is not granted by this Lease.

- 1.3 No Warranty of Title. Lessor claims title to the mineral estate covered by this Lease. Lessor does not warrant title nor represent that no one will dispute the title asserted by Lessor. It is expressly agreed that Lessor shall not be liable to Lessee for any alleged deficiency in title to the mineral estate, nor shall Lessee become entitled to any refund for any rentals, bonuses, or royalties paid under this Lease in the event of title failure.
2. RESERVATIONS TO LESSOR. Subject to the exclusive rights and privileges granted to Lessee under this Lease, and further provided that Lessor shall refrain from taking actions with respect to the Leased Premises that may unreasonably interfere with Lessee's operations, Lessor hereby excepts and reserves from the operation of this Lease the following rights and privileges (to the extent that Lessor has the right to grant such rights and privileges):
  - 2.1 Rights-of-Way and Easements. Lessor reserves the right, following consultation with the Lessee, to establish rights-of-way and easements upon, through or over the Leased Premises, under terms and conditions that will not unreasonably interfere with operations under this Lease, for roads, pipelines, electric transmission lines, transportation and utility corridors, mineral access, and any other purpose deemed reasonably necessary by Lessor.
  - 2.2 Other Mineral Leases. Lessor reserves the right to enter into mineral leases and agreements with third parties covering minerals other than coal, under terms and conditions that will not unreasonably interfere with operations under this Lease in accordance with Lessor's regulations, if any, governing multiple mineral development.
  - 2.3 Use and Disposal of Surface. To the extent that Lessor owns the surface estate of the Leased Premises and subject to the rights granted to the Lessee pursuant to this Lease, Lessor reserves the right to use, lease, sell, or otherwise dispose of the surface estate or any part thereof. Lessor shall notify Lessee of any such sale, lease, or other disposition of the surface estate.
  - 2.4 Previously Authorized Improvements. If authorized improvements have been placed upon the Leased Premises by a third party prior to the commencement of this Lease, Lessee shall allow the owner of such improvements to remove them within ninety (90) days after the Lease term commences. Nothing in this paragraph shall authorize Lessee to remove surface improvements where Lessor does not own the surface estate.
  - 2.5 Rights Not Expressly Granted. Lessor further reserves all rights and privileges of every kind and nature, except as specifically granted in this Lease.

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### 3. TERM OF LEASE: READJUSTMENT.

- 3.1 Primary Term. This Lease is granted for a "primary term" of ten (10) years commencing on the Effective Date and for a "secondary term" of an additional ten (10) years, subject to Lessee's compliance with the requirements of paragraph 3.3, Diligent Operations; Minimum Royalty.
- 3.2 Extension Beyond Secondary Term. Subject to Lessee's compliance with the other provisions of this Lease, this Lease shall remain in effect beyond the secondary term and for as long thereafter as coal is produced in commercial quantities from the Leased Premises, or from lands constituting either (i) a logical mining unit approved by the Bureau of Land Management containing the Leased Premises, or (ii) a mining unit, in which the recoverable coal reserves can be developed in an efficient, economical and orderly manner as a unit with due regard to the conservation of recoverable coal reserves. The second type of mining unit requires a determination by the Lessor that the criteria set forth in item (ii) have been satisfied. The satisfaction of either (i) or (ii) above shall mean that the Lease is contained within an "approved mining unit." For the purposes of this Lease, production of coal in commercial quantities shall mean production during each lease year of at least one per cent (1%) of the recoverable coal reserves within the Leased Premises or within lands constituting an approved mining unit which includes the Leased Premises, as such recoverable coal reserves are determined by Lessor after consultation with Lessee, subject to adjustment from time to time based upon reasonable justification from the Lessee.
- 3.3 Diligent Operations; Minimum Royalty. In the absence of actual production in commercial quantities as set forth in paragraph 3.2, Extension Beyond Secondary Term, this Lease shall remain in effect beyond the primary term only if the Lessee is engaged in diligent operations, or development activity (which development activity shall include, but not be limited to, pursuit of required permits and approvals), which in Lessor's reasonable discretion is calculated to advance development or production of coal from the Leased Premises or lands constituting an approved mining unit which includes the Leased Premises, and Lessee pays an annual minimum royalty in advance on or before the anniversary date of the Effective Date. The minimum royalty shall be calculated by determining the production royalty that would be payable upon production of one per cent (1%) of the recoverable coal reserves within the Leased Premises, as such recoverable coal reserves are determined by Lessor after consultation with Lessee, subject to adjustment from time to time based upon reasonable justification from the Lessee. The unit value of the recoverable coal reserves for purposes of determining the minimum royalty shall be determined by Lessor using the methodology set forth in 43 Code of Federal Regulations Section 3483.4(c)(1)-(3) (1998). Minimum royalties paid by Lessee pursuant to this paragraph may be credited against production royalties accruing during the term of this Lease.
- 3.4 Expiration; Cessation of Production. This Lease may not be extended pursuant to paragraph 3.3, Diligent Operations; Minimum Royalty, beyond the end of the twentieth year after the Effective Date except by the actual production of coal in commercial quantities from the Leased Premises or from lands constituting an approved mining unit which includes the Leased Premises. After expiration of the secondary term, this Lease will expire of its own terms, without the necessity of any notice or action by Lessor, if Lessee ceases production of coal in commercial quantities for an entire lease year, unless the Lease is suspended pursuant to paragraph 16.3, Suspension.
- 3.5 Readjustment. At the end of the primary term and at the end of each ten-year period that this lease is in effect, Lessor may readjust the terms and conditions of this Lease (including without limitation rental rates, minimum royalties, royalty rates and valuation methods, and provisions concerning reclamation). If

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within thirty (30) days after submission of the readjusted lease terms to the Lessee, the Lessee determines that any or all of the proposed readjusted terms and conditions are unacceptable, then Lessee shall so notify Lessor in writing and the parties shall attempt to resolve the objectionable term or condition. If the parties are unable to resolve the matter and agree upon the readjusted terms and conditions submitted by Lessor at the end of such ten (10) year period, Lessee shall forfeit any right to the continued extension of this lease, and the lease shall automatically terminate, provided that nothing herein shall be deemed to preclude Lessee from appealing any readjustment by Lessor pursuant to applicable law

- 3.6 **Relinquishment.** Lessee may relinquish all or portions of this Lease at any time by filing a written notice of relinquishment with Lessor. Lessor may disapprove any relinquishment if Lessee has failed to pay all rentals, royalties, and other amounts due and owing to the Lessor, if the lease is otherwise not in good standing, or if relinquishment would in Lessors's reasonable determination cause waste of economically recoverable coal. Lessee may not relinquish parcels smaller than a quarter-quarter section or surveyed lot. Upon approval, relinquishment shall relieve the Lessee of all future rental obligations as to the relinquished lands effective as of the date of filing of the relinquishment, but shall not relieve Lessee from other obligations to the extent provided in paragraph 15.2, Effect of Termination.
4. **BONUS BID.** Lessee agrees to pay Lessor a bonus bid upon each ton of recoverable coal in the Leased Premises on the same basis of valuation and timeliness of payments as Lessee may agree to pay the federal government upon like quality federal coal subsequently added to federal coal lease U-07064 or leased upon nearby federal lands to extend the area of deep-cover coal mining within the Dugout Canyon Mine. Lessor may require Lessee to submit a bond or other sufficient surety to secure Lessee's obligation to pay the bonus bid. The bonus bid may not be credited against any other payments, annual rentals or royalties accruing under the lease.
5. **RENTALS.** Lessee agrees to pay Lessor an annual rental of three dollars (\$3.00) for each acre and fractional part thereof within the Leased Premises. Lessee shall promptly pay annual rentals each year in advance on or before the anniversary date of the Effective Date. Lessee may not credit rentals against production royalties or against minimum royalties payable pursuant to paragraph 3.3, Diligent Operations; Minimum Royalty.
6. **ROYALTIES.**
- 6.1 **Production Royalties.** Lessee shall pay Lessor a production royalty of eight per cent (8%) of the value of all coal severed and removed from the Leased Premises. For all coal sold pursuant to an arm's-length contract, value shall be determined on the basis of the gross proceeds received by Lessee from the sale or disposition of such coal. Gross proceeds shall include all bonuses, allowances or other consideration of any nature received by Lessee for coal actually produced. For any coal that is sold or disposed of other than by an arms-length contract, or for coal that is used within the mine permit area containing the Leased Premises for generation of electricity or for gasification, liquefaction, in situ processing, or other method of extracting energy from such coal, the value of such coal shall be determined by Lessor with reference to (in order of priority): (i) comparable arms-length contracts or other dispositions of like-quality coal produced in the same coal field; (ii) prices reported for that coal to a public utility commission; (iii) prices reported to other governmental agencies; or (iv) other relevant information.
- 6.2 **Allowable Deductions.** It is expressly understood and agreed that none of Lessee's mining or production costs, including but not limited to costs for materials, labor, overhead, distribution, transportation within the mine permit area prior to the point of sale, loading, crushing, sizing, screening, or general and administrative activities, may be deducted in computing Lessor's royalty. All such costs shall be entirely borne by Lessee and are anticipated by the rate of royalty set forth in this Lease. In the event that the point



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of sale for coal produced from this Lease is located outside the mine permit area boundary, Lessee may deduct the reasonable, actual costs of transportation of such coal from the mine permit area boundary to the point of sale from gross proceeds in computing Lessor's royalty; provided, however, that transportation deductions for coal transported by Lessee, Lessee's affiliates, or by non-arm's-length contract are subject to review and modification by Lessor. Lessee shall be allowed to deduct its actual, reasonable washing and treatment costs from gross proceeds in computing Lessor's royalty; provided, however, that, upon Lessor's request Lessee shall provide to Lessor appropriate justification to demonstrate that Lessee's costs are reasonable.

- 6.3 Reference to Federal Regulations. It is the intent of Lessor and Lessee that the calculation of the value of coal for royalty purposes be consistent with federal coal regulations governing the valuation of coal, except where this Lease expressly provides otherwise. In no event shall the value of coal used for calculation of royalties under this Lease be less than the value which would be obtained were federal royalty valuation regulations applied.
- 6.4 Royalty Payment. For all coal severed and removed from the Leased Premises that is used, sold, transported or otherwise disposed of during a particular month, Lessee shall pay royalties to Lessor on or before the end of the next succeeding month. Royalty payments shall be accompanied by a verified statement, in a form approved by Lessor, stating the amount of coal sold or otherwise disposed of, the gross proceeds accruing to Lessee, the calculation of allowable deductions, and any other information reasonably required by Lessor to verify production and disposition of the coal or coal products. In the event that Lessee uses or disposes of coal pursuant to a non-arm's-length contract, or uses coal for generation of electricity or for gasification, liquefaction, in situ processing, or other method of extracting energy from such coal, Lessee shall notify Lessor of such use or disposal on or before the end of the next succeeding month following such use or disposal, and shall pay royalties upon Lessee's good faith estimate of the value of such coal, subject to Lessor's right to determine the value of such coal pursuant to paragraph 6.1, Production Royalties.
- 6.6 Suspension, Waiver or Reduction of Rents or Royalties. Lessor, to the extent not prohibited by applicable law, is authorized to waive, suspend, or reduce the rental or minimum royalty, or reduce the royalty applicable with respect to the entire Lease, whenever in Lessor's sole judgment it is necessary to do so in order to promote development, or whenever in the Lessor's sole judgment the Lease cannot be successfully operated under the terms provided herein.

7. RECORDKEEPING; INSPECTION; AUDITS.

- 7.1 Registered Agent; Records. Lessee shall maintain a registered agent within the State of Utah to whom any and all notices may be sent by Lessor and upon whom process may be served. Lessee shall also maintain an office within the State of Utah containing originals or copies of all maps, engineering data, permitting materials, books, records or contracts (whether such documents are in paper or electronic form) generated by Lessee that pertain in any way to coal production, output and valuation; mine operations; coal sales and dispositions; transportation costs; and calculation of royalties from the Leased Premises. Lessee shall maintain such documents for at least seven years after the date of the coal production to which the documents pertain.
- 7.2 Inspection. Lessor's employees and authorized agents at Lessor's sole risk and expense shall have the right to enter the Leased Premises to check scales as to their accuracy, and to go on any part of the Leased

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Premises to examine, inspect, survey and take measurements for the purposes of verifying production amounts and proper lease operations. Upon reasonable notice to Lessee, Lessor's employees and authorized agents shall further have the right to audit, examine and copy (at Lessor's expense) all documents described in paragraph 7.1, Registered Agent; Records, whether such documents are located at the mine site or elsewhere. Lessee shall furnish all conveniences necessary for said inspection, survey, or examination; provided, however, that such inspections shall be conducted in a manner that is in conformance with all applicable mine safety regulations and does not unreasonably interfere with Lessee's operations.

- 7.3 Geologic Information. In the event Lessee conducts core-drilling operations or other geologic evaluation of the Leased Premises, Lessor may inspect core samples, evaluations thereof, and proprietary geologic information concerning the Leased Premises.
- 7.4 Confidentiality. Any and all documents and geologic data obtained by Lessor through the exercise of its rights as set forth in paragraphs 7.2, Inspection., and 7.4, Geologic Information., may be declared confidential information by Lessee, in which event Lessor and its authorized agents shall maintain such documents and geologic data as protected records under the Utah Governmental Records Access Management Act or other applicable privacy statute and shall not disclose the same to any third party without the written consent of Lessee, the order of a court of competent jurisdiction requiring such disclosure, or upon termination of this Lease.

8. USE OF SURFACE ESTATE.

- 8.1 Lessor-Owned Surface. If Lessor owns the surface estate of all or some portion of the Leased Premises, by issuance of this Lease the Lessee has been granted the right to make use of such lands to the extent reasonably necessary and expedient for the economic operation of the leasehold. Lessee's right to surface use of Lessor-owned surface estate shall include the right to subside the surface. Such surface uses shall be exercised subject to the rights reserved to Lessor as provided in paragraph 2, RESERVATIONS TO LESSOR, and without unreasonable interference with the rights of any prior or subsequent lessee of Lessor.
- 8.2 Split-Estate Lands. If Lessor does not own the surface estate of any portion of the Leased Premises, Lessee's access to and use of the surface of such lands shall be determined by applicable law governing mineral development on split-estate lands, including without limitation applicable statutes governing access by mineral owners to split estate lands, and reclamation and bonding requirements. Lessee shall indemnify, defend and hold Lessor harmless for all claims, causes of action, damages, costs and expenses (including attorney's fees and costs) arising out of or related to damage caused by Lessee's operations to surface lands or improvements owned by third parties.

9. APPLICABLE LAWS AND REGULATIONS: HAZARDOUS SUBSTANCES

- 9.1 State of Utah and Trust Lands Statute and Regulations. This Lease is issued pursuant to Title 53C, Utah Code Annotated, 1953, as amended, and Lessee is subject to and shall comply with all current and future rules and regulations adopted by the School and Institutional Trust Lands Administration and its successor agencies.

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- 9.2 Other Applicable Laws and Regulations. Lessee shall comply with all applicable federal, state and local statutes, regulations, and ordinances, including without limitation the Utah Coal Mining and Reclamation Act, applicable statutes and regulations relating to mine safety and health, and applicable statutes, regulations and ordinances relating to public health, pollution control, management of hazardous substances and environmental protection.
- 9.3 Hazardous Substances. Lessee [or other occupant pursuant to any agreement authorizing mining] shall not keep on or about the premises any hazardous substances, as defined under 42 U.S.C. Section 9601(14) or any other Federal environmental law, any regulated substance contained in or released from any underground storage tank, as defined by the Resource Conservation and Recovery Act, 42 U.S.C. Section 6991, *et seq.*, or any substances defined and regulated as "hazardous" by applicable State law, (hereinafter, for the purposes of this Lease, collectively referred to as "Hazardous Substances") unless such substances are reasonably necessary in Lessee's mining operations, and the use of such substances or tanks is noted and approved in the Lessee's mining plan, and unless Lessee fully complies with all Federal, State and local laws, regulations, statutes, and ordinances, now in existence or as subsequently enacted or amended, governing Hazardous Substances. Lessee shall immediately notify Lessor, and any other Federal, State and local agency with jurisdiction over the Leased Premises, or surface thereof, or contamination thereon, of (i) all reportable spills or releases of any Hazardous Substance affecting the Leased Premises, (ii) all failures to comply with any applicable Federal, state or local law, regulation or ordinance governing Hazardous Substances, as now enacted or as subsequently enacted or amended, (iii) all inspections of the Leased Premises by, or any correspondence, order, citations, or notifications from any regulatory entity concerning Hazardous Substances affecting the Leased Premises, (iv) all regulatory orders or fines or all response or interim cleanup actions taken by or proposed to be taken by any government entity or private Party concerning the Leased Premises.
- 9.4 Hazardous Substances Indemnity. Lessee [or other occupant pursuant to any agreement authorizing mining] shall indemnify, defend, and hold harmless Lessor, its agencies, employees, officers, and agents with respect to any and all damages, costs, liabilities, fees (including attorneys' fees and costs), penalties (civil and criminal), and cleanup costs arising out of or in any way related to Lessee's use, disposal, transportation, generation, sale or location upon or affecting the Leased Premises of Hazardous Substances, as defined in paragraph 9.4 of this Lease. This indemnity shall extend to the actions of Lessee's employees, agents assigns, sublessees, contractors, subcontractors, licensees and invitees. Lessee shall further indemnify, defend and hold harmless Lessor and the United States from any and all damages, costs, liabilities, fees (including attorneys' fees and costs), penalties (civil and criminal), and cleanup costs arising out of or in any way related to any breach of the provisions of this Lease concerning Hazardous Substances. This indemnity is in addition to, and in no way limits, the general indemnity contained in paragraph 16.1 of this Lease.
- 9.5 Waste Certification. The Lessee shall provide upon abandonment, transfer of operation, assignment of rights, sealing-off of a mined area, and prior to lease relinquishment, certification to the Lessor and the Bureau of Land Management that, based upon a complete search of all the operator's records for the Lease, and upon its knowledge of past operations, there have been no reportable quantities of hazardous substances as defined in 40 Code of Federal Regulations Section 302.4, or used oil as defined in Utah Administrative Code R315-15, discharged (as defined at 33 U.S.C. Section 1321(a)(2)), deposited or released within the Leased Premises, either on the surface or underground, and that all remedial actions necessary have been taken to protect human health and the environment with respect to such substances. Lessee shall additionally provide to Lessor and the Bureau of Land Management a complete list of all

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hazardous substances, hazardous materials, and their respective Chemical Abstracts Service Registry Numbers, and oil and petroleum products used or stored on, or delivered to, the Leased Premises. Such disclosure will be in addition to any other disclosure required by law or agreement.

10. BONDING.

- 10.1 Lease Bond Required. At any time after this Lease is executed, if requested by the Lessor, Lessee shall execute and file with the Lessor a good and sufficient bond or other financial guarantee acceptable to Lessor in order to: (a) guarantee Lessee's performance of all covenants and obligations under this Lease, including Lessee's obligation to pay royalties; and (b) ensure compensation for damage, if any, to the surface estate and any surface improvements. The form of the Lease Bond shall meet all federal mineral lease bond requirements as described in 43 Code of Federal Regulations Subpart 3474. Lessee shall also satisfy all reclamation bonding requirements of the Utah Division of Oil, Gas and Mining ("UDOGM") in connection with the issuance of a mine permit which includes the Leased Premises.
- 10.2 Reclamation Bonding. The bond filed with the Utah Division of Oil, Gas and Mining ("UDOGM") in connection with the issuance of a mine permit which includes the Leased Premises shall be deemed to satisfy Lessor's bonding requirements with respect to Lessee's reclamation obligations under this Lease; provided, however, upon notice to Lessee and a public hearing with respect to the basis for its decision, the Lessor may, in its reasonable discretion, determine that the bond filed with UDOGM is insufficient to protect Lessor's interests. In such an event the Lessor shall enter written findings as to the basis for its calculation of the perceived insufficiency and enter an order establishing the amount of additional bonding required. Lessee shall file any required additional bond with Lessor within thirty (30) days after demand by Lessor. Lessor may increase or decrease the amount of any additional bond from time to time in accordance with the same procedure.
- 10.3 Release of Additional Bond. Any additional bond required by Lessor pursuant to 10.2, Reclamation Bonding, may be released by Lessor at any time and shall be released no later than the time of final bond release by UDOGM with respect to the Leased Premises.

11. WATER RIGHTS.

- 11.1 Water Rights in Name of Lessor. If Lessee files to appropriate water for coal mining operations on the Leased Premises, the filing for such water right shall be made by Lessee in the name of Lessor at no cost to Lessor, and such water right shall become an appurtenance to the Leased Premises, subject to Lessee's right to use such water right at no cost during the term of this Lease.
- 11.2 Option to Purchase. If Lessee purchases or acquires an existing water right for coal mining operations on the Leased Premises, Lessor shall have the option to acquire that portion of such water right as was used on the Leased Premises upon expiration or termination of this Lease. The option price for such water right shall be the fair market value of the water right as of the date of expiration or termination of this Lease. Upon expiration or termination of this Lease, Lessee shall notify Lessor in writing of all water rights purchased or acquired by Lessee for coal mining operations on the Leased Premises and its estimate of the fair market value of such water right. Lessor shall then have forty-five (45) days to exercise its option to acquire the water by payment to Lessee of the estimated fair market value. If Lessor disagrees with Lessee's estimate of fair market value, Lessor shall notify Lessee of its disagreement within the 45 day option exercise period. The fair market value of the water right shall then be appraised by a single

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appraiser mutually acceptable to both parties, which appraisal shall be final and not subject to review or appeal. If the parties cannot agree upon the choice of an appraiser, the fair market value of the water right shall be determined by a court of competent jurisdiction. Conveyance of any water right pursuant to this paragraph shall be by quit claim deed.

12. ASSIGNMENT OR SUBLEASE; OVERRIDING ROYALTIES.

- 12.1 Consent Required. Lessee shall not assign or sublease this Lease in whole or in part, or otherwise assign or convey any rights or privileges granted by this Lease, including, without limitation, creation of overriding royalties or production payments, without the prior written consent of Lessor. Any assignment, sublease or other conveyance made without prior written consent of Lessor shall have no legal effect unless and until approved in writing by Lessor. Exercise of any right with respect to the Leased Premises in violation of this provision shall constitute a default under this Lease.
- 12.2 Binding Effect. All of the terms and provisions of this Lease shall be binding upon and shall inure to the benefit of their respective successors, assigns, and sublessees.
- 12.3 Limitation on Overriding Royalties. Lessor reserves the right to disapprove the creation of an overriding royalty or production payment that would, in Lessor's reasonable discretion, constitute an unreasonable economic burden upon operation of the Lease. In exercising its discretion to disapprove the creation of an overriding royalty, Lessor shall consult with Lessee and any third parties involved and shall prepare findings to evidence the basis of its decision. Cumulative overriding royalties of 2% or less shall be deemed presumptively reasonable unless special circumstances are shown by Lessor to exist.

13. OPERATIONS.

- 13.1 Permitting. Before Lessee commences exploration, drilling, or mining operations on the Leased Premises, it shall have obtained such permits and posted such bonds as may be required under applicable provisions of the Utah Coal Mining and Reclamation Act, the Surface Mining Control and Reclamation Act, and associated regulations, together with applicable regulations of the surface management agency. Lessee shall maintain any required permits in place for the duration of mining operations and reclamation. Upon request, Lessee shall provide Lessor with a copy of all regulatory filings relating to permitting matters.
- 13.2 Plan of Operations. Prior to the commencement of any underground mining operations on the Leased Premises, Lessee shall obtain Lessor's approval of a plan of operations for the Leased Premises. The plan of operations shall contain all information required to be contained in a federal Resource Recovery and Protection Plan, as described in 43 Code of Federal Regulations Section 3482.1(b) and (c) (1998). Lessor may modify the proposed plan of operations as is needed to insure that there is no waste of economically recoverable coal reserves contained on the Leased Premises. In this context "waste" shall mean the inefficient utilization of, or the excessive or improper loss of an otherwise economically recoverable coal resource. Lessor shall notify Lessee in writing of its approval or modifications of the plan of operations. The plan of operations submitted by Lessee shall be deemed approved by Lessor if Lessor has not otherwise notified Lessee within sixty (60) days of filing.
- 13.3 Plan of Operations - Modification. In the event that material changes are required to the plan of operations during the course of mining, Lessee shall submit a modification of the plan of operations to the Lessor. Routine adjustments to the plan of operations based upon geologic circumstances encountered during

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day-to-day mining operations do not require the submission of a modification. If the proposed changes require emergency action by Lessor, then the Lessee shall so notify the Lessor at the time of submission of the modification and the parties shall use their best efforts to meet the Lessee's time schedule regarding implementation of the changes. Non-emergency modifications will be reviewed promptly by Lessor to insure that there is no waste of economically recoverable coal reserves pursuant to the plan of operations, as modified, and Lessor shall notify lessee in writing of its approval or modification of the proposed modification. Modifications shall be deemed approved by Lessor if Lessor has not otherwise notified Lessee within thirty (30) days of filing with Lessor.

- 13.4 Mine Maps. Lessee shall maintain at the mine office clear, accurate, and detailed maps of all actual and planned operations prepared and maintained in the manner prescribed by 43 Code of Federal Regulations Section 3482.3 (1998). Lessee shall provide copies of such maps to Lessor upon request.
- 13.5 Good Mining Practices. Lessee shall conduct exploration and mining operations on the Leased Premises in accordance with standard industry operating practices, and shall avoid waste of economically recoverable coal. Lessee shall comply with all regulations and directives of the Mine Safety and Health Administration or successor agencies for the health and safety of employees and workers. Lessee shall further comply with the performance standards for underground resource recovery set forth at 43 Code of Federal Regulations Section 3484.1(c) (1998); provided, however, that Lessor may waive such standards from time to time in its reasonable discretion, upon request by Lessee. Coal shall be mined from this Lease by underground methods only.
- 13.6 Mining Units. Lessor may approve the inclusion of the Leased Premises in a mining unit with federal, private or other non-state lands upon terms and conditions that it deems necessary to protect the interests of the Lessor, including without limitation segregation of production, accounting for commingled coal production, and minimum production requirements or minimum royalties for the Leased Premises.

14. EQUIPMENT; RESTORATION.

- 14.1 Equipment. Upon termination of this Lease, Lessee shall remove, and shall have the right to remove, all improvements, equipment, stockpiles, and dumps from the Leased Premises within six (6) months; provided, however, that Lessor may, at Lessor's sole risk and expense, and subject to Lessee's compliance with requirements imposed by UDOGM and MSHA, require Lessee to retain in place underground timbering supports, shaft linings, rails, and other installations reasonably necessary for future mining of the Leased Premises. All improvements and equipment remaining on the Leased Premises after six (6) months may be deemed forfeited to Lessor upon written notice of such forfeiture to Lessee. Lessee may abandon underground improvements, equipment of any type, stockpiles and dumps in place if such abandonment is in compliance with applicable law, and further provided that Lessee provides Lessor with financial or other assurances sufficient in Lessor's reasonable discretion to protect Lessor from future environmental liability with respect to such abandonment or any associated hazardous waste spills or releases. Lessee shall identify and locate on the mine map the location of all equipment abandoned on the Lease Premises.
- 14.2 Restoration and Reclamation. Upon termination of this Lease, Lessee shall reclaim the Leased Premises in accordance with the requirements of applicable law, including mine permits and reclamation plans on file with UDOGM. Lessee shall further abate any hazardous condition on or associated with the Leased Premises. Lessee and representatives of all governmental agencies having jurisdiction shall have the right

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to re-enter the Leased Premises for reclamation purposes for a reasonable period after termination of the Lease.

15. DEFAULT

15.1 Notice of Default; Termination. Upon Lessee's violation of or failure to comply with any of the terms, conditions or covenants set forth in this Lease, Lessor shall notify Lessee of such default by registered or certified mail, return receipt requested, at the last address for Lessee set forth in Lessor's files. Lessee shall then have thirty (30) days, or such longer period as may be granted in writing by Lessor, to either cure the default or request a hearing pursuant to the Lessor's administrative adjudication rules. In the event Lessee fails to cure the default or request a hearing within the specified time period, Lessor may cancel this Lease without further notice to or appeal by Lessee.

15.2 Effect of Termination. The termination of this Lease for any reason, whether through expiration, cancellation or relinquishment, shall not limit the rights of the Lessor to recover any royalties and/or damages for which Lessee may be liable, to recover on any bond on file, or to seek injunctive relief to enjoin continuing violations of the Lease terms. No remedy or election under this Lease shall be deemed exclusive, but shall, wherever possible, be cumulative with all other remedies available under this Lease, at law, or in equity. Lessee shall surrender the Leased Premises upon termination; however, the obligations of Lessee with respect to reclamation, indemnification and other continuing covenants imposed by this Lease shall survive the termination.

16. MISCELLANEOUS PROVISIONS.

16.1 Indemnity. Except as limited by paragraph 7.2, Inspection, Lessee shall indemnify and hold Lessor harmless for, from and against each and every claim, demand, liability, loss, cost, damage and expense, including, without limitation, attorneys' fees and court costs, arising in any way out of Lessee's occupation and use of the Leased Premises, including without limitation claims for death, personal injury, property damage, and unpaid wages and benefits. Lessee further agrees to indemnify and hold Lessor harmless for, from and against all claims, demands, liabilities, damages and penalties arising out of any failure of Lessee to comply with any of Lessee's obligations under this Lease, including without limitation attorneys' fees and court costs.

16.2 Interest. Except as set forth in paragraph 4, BONUS BID, interest shall accrue and be payable on all obligations arising under this Lease at such rate as may be set from time to time by rule enacted by Lessor. Interest shall accrue and be payable, without necessity of demand, from the date each such obligation shall arise.

16.3 Suspension. In the event that Lessor in its reasonable discretion determines that suspension is necessary in the interests of conservation of the coal resource, or if Lessee has been prevented from performing any of its obligations or responsibilities under this Lease or from conducting mining operations by labor strikes, fires, floods, explosions, riots, any unusual mining casualties or conditions, Acts of God, government restrictions or orders, severe weather conditions, or other extraordinary events beyond its control, then the time for performance of this Lease by Lessee shall be suspended during the continuance of such acts which prevent performance, excepting any payments due and owing to Lessor.

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- 16.4 Consent to Suit; Jurisdiction (i) Lessor and Lessee agree that all disputes arising out of this Lease shall be litigated only in the Third Judicial District Court for Salt Lake County, Utah; (ii) Lessee consents to the jurisdiction of such court; and (iii) Lessee shall not bring any action against Lessor without exhaustion of available administrative remedies and compliance with applicable requirements of the Utah Governmental Immunity Act.
- 16.5 No Waiver. No waiver of the breach of any provision of this Lease shall be construed as a waiver of any preceding or succeeding breach of the same or any other provision of this Lease, nor shall the acceptance of rentals or royalties by Lessor during any period of time in which Lessee is in default be deemed to be a waiver of such default.
- 16.6 Severability. The invalidity of any provision of this Lease, as determined by a court of competent jurisdiction, shall in no way affect the validity of any other provision hereof.
- 16.7 Entire Lease. This Lease, together with any attached stipulations, sets forth the entire agreement between Lessor and Lessee with respect to the subject matter of this Lease. No subsequent alteration or amendment to this Lease shall be binding upon Lessor and Lessee unless in writing and signed by each of them.



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IN WITNESS WHEREOF, the parties have executed this Lease as of the date hereinabove first written.

APPROVED AS TO FORM:  
MARK L. SHURTLEFF

ATTORNEY GENERAL

By \_\_\_\_\_

Form Approved: 3-14-07

THE STATE OF UTAH, acting by and through the  
SCHOOL AND INSTITUTIONAL TRUST LANDS  
ADMINISTRATION ("LESSOR")

KEVIN S. CARTER, DIRECTOR

By \_\_\_\_\_

THOMAS B. FADDIES

ASSISTANT DIRECTOR/MINERALS

ARK LAND COMPANY ("LESSEE")

By: \_\_\_\_\_

Its: \_\_\_\_\_

SEAN MCKAY  
PRESIDENT

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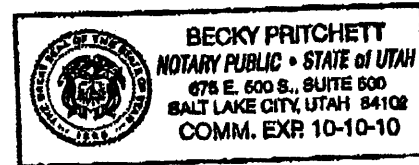
STATE OF UTAH )  
 ) ss.  
 COUNTY OF SALT LAKE )

On the 14th day of March, 2007, personally appeared before me  
Thomas B. Faddis who being by me duly sworn did say that he is  
Asst. Director - Mineral of the School and Institutional  
 Trust Lands Administration of the State of Utah and the signer of the above instrument, who duly acknowledged that he  
 executed the same.

Given under my hand and seal this 14th day of March, 2007.

Becky Pritchett  
 Notary Public  
 Residing at: \_\_\_\_\_

My commission expires:



STATE OF ~~UTAH~~ MISSOURI  
 ) ss.  
 COUNTY OF ~~SALT LAKE~~ ST LOUIS )

On the 5th day of MARCH, 2007, personally appeared before me  
STEVEN E. HIGGINS, PRESIDENT who being duly sworn did say that he is an officer of  
ARK LAND and that said instrument was signed in behalf of said corporation by  
 resolution of its Board of Directors, and said that he acknowledged to me that said corporation executed the same.

Given under my hand and seal this 5th day of March, 2007.

Mary C. Hamilton  
 Notary Public  
 Residing at: St. Louis, MO

My commission expires



MARY C. HAMILTON  
 St. Louis City  
 My Commission Expires  
 September 14, 2007

**JOINDER OF ML 50582-OBA  
TO BOOK CLIFFS COAL UNIT**

**Recitals**

1. The Book Cliffs Coal Unit agreement was entered into effective November 1, 2006 between the Utah School and Institutional Trust lands Administration, 675 East, 500 South, Salt Lake City, UT 840102 ("SITLA" of "Lessor") and Canyon Fuel Company, LLC, C/O Ark Land Company, CityPlace One, Suite 300, St. Louis, MO 63141 ("Lessee"), to unitize four trust land coal leases, ML 42648, ML 42649, ML 44365 and ML 48435-OBA, within the Soldier Canyon Mine/Dugout Canyon Mine coal mine complex for purposes of development and production.

2. Effective February 1, 2007, Trust Land coal lease ML 50582-OBA was entered into between the Utah School and Institutional Trust lands Administration, 675 East, 500 South, Salt Lake City, UT 840102 ("SITLA" of "Lessor") and Canyon Fuel Company, LLC, C/O Ark Land Company, CityPlace One, Suite 300, St. Louis, MO 63141 ("Lessee") with an.

3. The lands comprising coal lease ML 50582-OBA include the W2, Section 16, Township 13 South, Range 13 East, SLB&M, Carbon County which shares a common corner with the lands comprising coal lease ML 48435-OBA which is within the Book Cliffs Coal Unit. It is in the interest of both Lessee and Lessor to mine the coal within the lands within ML 50582 in conjunction with mining activity planned in the Book Cliffs Coal Unit area.

NOWHEREFORE: It is agreed by the parties hereto that the lands within ML 50582-OBA are hereby joined to the Book Cliffs Coal Unit pursuant to the terms of ML 50582-OBA and the Book Cliffs Coal Unit Agreement, effective upon execution of this amendment, for all purposes of development and production. The terms and conditions of mineral lease ML 50582-OBA are superseded and governed by the terms and conditions of the Book Cliffs Coal Unit to the extent allowed by law.

Joinder of ML 50582-OBA  
To Book Cliffs Coal Unit

IN WITNESS WHEREOF, the parties have executed this amendment as follows.

THE STATE OF UTAH, acting by and through the  
SCHOOL AND INSTITUTIONAL TRUST LANDS  
ADMINISTRATION ("LESSOR")

APPROVED AS TO FORM:  
MARK L. SHURTLEFF  
ATTORNEY GENERAL

By

Form Approved: 34407

KEVIN S. CARTER, DIRECTOR

By

THOMAS B. FADDIES  
ASSISTANT DIRECTOR/MINERALS

ARK LAND COMPANY ("LESSEE")

By:

Its:

Joinder of ML 50582-OBA  
To Book Cliffs Coal Unit

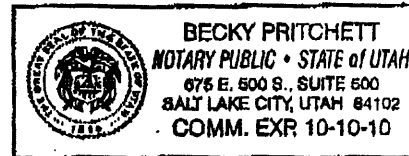
STATE OF UTAH )  
COUNTY OF SALT LAKE )

On the 14th day of March, 20 07, personally appeared before me THOMAS B. FADDIES who duly sworn did say that he is Assistant Director of the School & Institutional Trust Lands Administration of the State of Utah and the signer of the above instrument, who duly acknowledged that he executed the same.

Given under my hand and seal this 14th day of March, 20 07.

Becky Pritchett  
NOTARY PUBLIC, residing at:

My Commission Expires:



MISSOURI  
STATE OF ~~UTAH~~ )  
COUNTY OF ST. LOUIS

On the 5th day of March, 20 07, personally appeared before me STEVEN E. McCLURDY, PRESIDENT, who being duly sworn did say that he is an officer of and that said instrument was signed in behalf of said corporation by resolution of its Board of Directors, and said acknowledged to me that said corporation executed the same.

Given under my hand and seal this 5th day of March, 20 07.

Mary C. Hamilton  
NOTARY PUBLIC, residing at:

My Commission Expires



MARY C. HAMILTON  
St Louis City  
My Commission Expires  
September 14, 2007

Canyon Fuel Company, LLC  
SCM/Dugout Canyon Mine

Mining and Reclamation Plan  
October 15, 2007 ~~January 29, 2007~~

## **CHAPTER 2**

### **SOILS**

## **CHAPTER 2**

### **SOILS**

#### **210 INTRODUCTION**

This chapter and associated appendices of this M&RP contain all pertinent information relating to identification, management, and reclamation activities associated with the soil resources present in the disturbed area of the Dugout Canyon Mine and the Pace Canyon Fan Portal Breakout. The information has been compiled from the previously approved soil sections for the Sage Point-Dugout Canyon Mine and Soldier Canyon Mine permits, ACT/007/009 and ACT/007/018, respectively, as well as new soil survey information gathered as part of this permit application. The soil studies were conducted in accordance with the Utah Division of Oil, Gas, and Mining guidelines that were in effect at the time each study was conducted. All previous surveys fulfilled the requirements established by the U.S. Soil Conservation Service (SCS). The site specific soil survey conducted for this permit application was conducted in accordance with the standards set by the National Cooperative Soil Survey and analyzed by horizon according to Table 1 of the Division's "Guidelines for the Management of Topsoil and Overburden for Underground and Surface Coal Mining" (Leatherwood, 1988).

Additional information can be found in the following amendments: Methane Degassification Amendment (August 2003), Refuse Pile Amendment (February 2003), and the Leachfield Addendum A-1 (March 2001). The remainder of the State Lease ML-48435-OBA (SITLA Lease) was incorporated into the Dugout Canyon Mine permit area in 2005.

A base map of the soils in the permit area has been created by compiling maps from the "Soil Survey of Carbon Area, Utah" prepared by the SCS (Jensen, 1988). The base map illustrates the locations and areal extent of the endemic soil resources within the permit area at an Order III level (Plate 2-1). In the disturbed area of the permit area, an Order I survey was conducted. The locations and areal extent of the endemic soil resources within the disturbed area identified during the Order I survey are illustrated on Plate 2-2.

This chapter provides a description of the pre-mining resources as specified under R645-301-221. Topsoil and subsoil to be saved under R645-301-232 will be removed and segregated from other material. After removal, topsoil will be immediately redistributed in accordance with R645-301-242, stockpiled pending redistribution under R645-301-234, or if demonstrated that an alternative procedure will provide equal or more protection for the topsoil, the Applicant will seek approval from the Division.

~~In 2007, 40 acres was added to Federal Coal Lease U-07064-027821 to accommodate a revised mine plan.~~ In 2007 acreage (487.57 acres) was added to existing Federal Coal Lease U-07064-027821, two hundred and forty-seven acres of this added acreage is already included as part of the Dugout permitted area. Acreage was previously added to the permit area in excess of the Federal lease acreage to act as a subsidence buffer zone (207 acres) and to accommodate a revised mine plan (40 acres). In addition, State Lease ML-50582-OBA (320 acres, more or less) was issued to Dugout Canyon Mine in 2007. Future surface disturbance of these leases will be permitted as needed, the disturbance may included degas and exploration well pads, etc. Refer to Plate 1-2 for the location of the acreage incorporated into the permit boundary.

## **220 ENVIRONMENTAL DESCRIPTION**

The Dugout Canyon Mine facilities are located in the northern Book Cliffs - Roan Plateau region. More specifically, the mine is located within Dugout Canyon and Pace Canyon. The majority of the disturbed area is located in Dugout Canyon, with fan portal facilities located in Pace Canyon (Plate 2-1 and PC5-2). The elevation of the disturbed area ranges between approximately 7000 and 7150 feet above MSL. Soils in the mine area are not cultivated due to their thin nature and relatively steep slopes on which they lie. These soils have formed in colluvium derived from sandstone and shale. Soils in the area are usually shallow and consist predominantly of stony to gravelly sandy loams with moderate permeability. The soils are highly susceptible to water erosion. Rock outcrops consist of alternating layers of sandstone and shale. Subordinate amounts of coal are also present.



The Pace Canyon Fan Portal Breakout is located in Pace Canyon (T13S. R13E, Section 30, N1/2NW14). The elevation of the disturbed area ranges between approximately 6950 and 7060 feet above MSL. Soils in the mine area are not cultivated due to their thin nature and relatively steep slopes on which they lie. These soils have been previously disturbed by various activities in the canyon, such as road construction, exploration, mining, logging, etc. The fan area encompasses steep rocky canyon walls with unconsolidated sediment benches.

### **221 Prime Farmland Investigation**

As part of the application for the Sage Point-Dugout Canyon Mine permit, ACT/007/009, a reconnaissance of the disturbed areas was conducted in 1980 to determine if prime farmland was present, and if present, whether it would be impacted by mining activities. The reconnaissance included the presently-proposed disturbed area within the Dugout Canyon Mine permit area. Copies of the applicable pages from the prime farmland investigation for the Sage Point-Dugout Canyon Mine permit and correspondence with the Soil Conservation Service have been included as Appendix 2-1. One area within the previous area of investigation was determined to potentially be prime farmland. However, this area was located near the mouth of Soldier Creek Canyon, outside of the presently proposed permit area. No prime farmland was found in Dugout Canyon or anywhere else within the presently-proposed permit area during the previous investigation.

As part of this permit application, a survey of the disturbed area of the Dugout Canyon Mine was conducted to determine whether the soils could be considered as prime farmland. The Dugout Canyon Mine disturbed area lies within the Rock outcrop-Rubbleland-Travessilla complex and Croydon loam soils area (Plates 2-1 and 2-2). Neither of these soils are considered suitable prime farmland as described by the SCS (Jensen, 1988). No evidence of past cultivation of the soils in the disturbed area was found during the site investigation. Hence, based on the results of both detailed investigations conducted within the area, it is concluded that no prime farmland exists within the proposed permit area.

The survey for prime farmland investigation for the fan portal site was completed by Leland Sasser of the NRCS. The area planned for disturbance is not considered prime farmland. Refer to Appendix 2-1 for a copy of Mr. Sasser's letter.

## **222 Soil Survey**

Soil survey information for those portions of the permit area to be affected by surface operations at the Dugout Canyon Mine is presented in Sections 222.100 through 222.300.

### **222.100 Soils Map**

A map delineating the areal extent of the endemic soils resources within the permit area at an Order III survey level is presented on Plate 2-1. A description of these soils has been reproduced from the SCS "Soil Survey of the Carbon County Area" (Jensen, 1988), and has been included as Appendix 2-2. An Order I soil survey was conducted of the Dugout Canyon Mine disturbed area in October and November 1995. Plate 2-2 illustrates the areal extent of the soils studied as part of the Order I soil survey, the location of the soil test pits excavated during the survey, and the extent of the identified soils.

Dan Larsen, Soil Scientist performed a survey of the Fan Portal area in 2003 and 2004. The 2003 survey was done in conjunction with a BLM environmental assessment for coal exploration holes. The 2004 survey was done on November 5, in conjunction with the proposed installation of the fan. A copy of the 2004 survey, test pit logs and a map showing the location of 2003 -2004 test pit locations is in Appendix 2-3.

The expansion of the permit area in 2007 to add acreage to Federal Coal Lease U-07064-027821 (40 acres, NW1/4NW1/4, Section 21, Township 13S, Range 13E) will include soils mapped as Units 62, 97, and 100 (see Plate 2-1). **Area added in 2007 to Sections 16, 17 and 18, T13S R13E under leases U-07064-027821 and ML-50582-OBA will include soils mapped as Units 7, 62, 97,**

100, and 101 (see Plate 2-1). Surface disturbance will be permitted as needed to facilitate mining activities.

### 222.200 Soil Identification

Following is a list of the soils found in and adjacent to the permit area. Their corresponding map units as illustrated on Plate 2-1 are also listed.

<u>Map Unit</u>	<u>Soil Identification</u>
3	Badland-Rubbleland-Rock outcrop complex
6	Beje-Comodore complex
7	Beje-Trag complex
13	Cabba family-Guben-Rock outcrop complex
21	Croydon loam, 8 to 30 percent slopes
23	Curecanti family - Pathead complex
26	Doney family, 50 to 70 percent slopes
32	Frandsen-Gullied land complex
33	Gerst-Badland-Rubbleland complex, 15 to 50 percent slopes
36	Gerst-Strych-Badland complex, 3 to 50 percent slopes
37	Gerst-Strych-Badland complex, 50 to 70 percent slopes
46	Guben-Pathead extremely stony loams
47	Guben-Rock outcrop complex
50	Haverdad loam, moist, 1 to 5 percent slopes
52	Hernandez family, 3 to 8 percent slopes
53	Hernandez family, moist, 1 to 6 percent slopes
62	Midfork family-Comodore complex
66	Mivida gravelly fine sandy loam, 3 to 8 percent slopes
72	Pathead-Corecanti family association
75	Perma family, 15 to 40 percent slopes
81	Persayo-Greybull complex
84	Podo-Rock outcrop complex
86	Rabbitex-Doney family-Midfork family complex
88	Rabbitex family-Datino Variant complex
96	Rock outcrop-Rubbleland-Travessilla complex
97	Rottulee family-Trag complex
100	Senchert loam, 3 to 15 percent slopes
101	Senchert loam, 30 to 50 percent slopes
103	Senchert-Toza family complex
105	Senchert family-Senchert complex
107	Supert-Winetti complex
109	Silas-Brycan loams

113 Strych very stony loam, 3 to 15 percent slopes

According to the SCS (Jensen, 1988), soils present on the east facing slopes of Dugout Canyon are part of the Rock outcrop-Rubbleland-Travessilla complex while those on the west facing slopes are part of the Croydon loam and Midfork family-Comodore complex.

However, observation of the soils present on the west and northwest facing slopes suggest that inclusions of the Comodore-Datino Variant complex are prevalent throughout. The conclusion that Comodore-Datino Variant complex soils are present in this area is based on the presence of characteristics typical of these soils such as: 40 to 60 percent slopes, elevations of slopes between 6800 and 8100 feet, 40 to 60 percent slopes, Douglas-fir and related vegetation, and very stony, relatively shallow soils. A telephone conversation between Mr. Chris D. Hansen of Canyon Fuel Company, LLC, Ms. Vicky Bailey of EarthFax Engineering, Inc. and Mr. Leland Sausser of the Natural Resources Conservation Service concerning the presence of Comodore-Datino Variant complex soils within areas mapped as Croydon loam occurred on March 3, 1998. Mr. Sausser briefly reviewed available maps and photos and agreed that this may indeed occur but the maps in the Soil Survey of Carbon Area, Utah (Jensen, 1988) are generally correct as published.

Soils present in the narrow V-shaped Dugout Canyon that lie within the disturbed area of the mine have been identified and characterized. A large portion of the mine area is covered with overburden that consists of soil mixed with coal waste and/or waste rock from previous mining operations at the site. In these areas, the original soil structure has been obliterated or the native soils have been deeply covered. The remainder of the disturbed area has soils that appear to be in-place or have been only slightly disturbed. The approximate boundary between the overburden and in-place and/or slightly disturbed soils is illustrated on Plate 2-2. The overburden has been labeled on Plate 2-2 as OB while the in-place soils have been labeled as TS.

The overburden is a mixture of rock and/or coal waste with Travessilla soils. The Travessilla soils are classified as loamy, mixed (calcareous) mesic, Lithic Ustic Torriorthents (Jensen, 1988). Soil type TS is a loamy, mixed, Typic Haploboroll.

Canyon Fuel Company, LLC  
SCM/Dugout Canyon Mine

Mining and Reclamation Plan  
October 15, 2007 ~~January 29, 2007~~

## **APPENDIX 2-2**

Soil Conservation Survey Descriptions of the Permit Area Soils



**26—Doney family, 50 to 70 percent slopes.** This moderately deep, well drained soil is on mountain slopes. It is in the vicinity of Bruin Point and Price Canyon. It formed in residuum and colluvium derived dominantly from siltstone and shale. Slopes are 100 to 300 feet long, are slightly concave, and dominantly have south and west aspects. The present vegetation is mainly Salina wildrye, bluebunch wheatgrass, mountain big sagebrush, snowberry, and lupine. Elevation is 8,100 to 9,500 feet. The average annual precipitation is 16 to 20 inches, the average annual air temperature is 38 to 45 degrees F, and the average freeze-free period is 70 to 100 days.

Typically, the surface layer is brown stony loam about 4 inches thick. The subsoil is pale brown loam 11 inches thick. The substratum to a depth of 35 inches is light gray loam over shale. Depth to weathered shale ranges from 20 to 40 inches.

Included in this unit are about 10 percent Pathead extremely stony loam on side slopes, 5 percent Rottulee family loam in drainageways, and small areas of a Midfork family soil that has slopes of 50 to 70 percent and has north and east aspects, Rock outcrop that occurs as ledges, and Curecanti family soil in the Price Canyon area.

Permeability of the Doney family soil is moderate. Available water capacity is about 4.5 to 6.0 inches. Water supplying capacity is 7 to 11 inches. Effective rooting depth is 20 to 40 inches. The organic matter content of the surface layer is 1 to 3 percent. Runoff is rapid, and the hazard of water erosion is moderate.

This unit is used as wildlife habitat and rangeland.

The potential plant community on the Doney family soil is 60 percent grasses, 15 percent forbs, and 25 percent shrubs. Among the important plants are Salina wildrye, prairie junegrass, bluegrass, and snowberry.

This unit is not grazeable by livestock because of the steepness of slope and the hazard of erosion.

This map unit is in capability subclass VIIe, nonirrigated, and in the Mountain Very Steep Loam (Saline Wildrye) range site.

## CHAPTER 3

### BIOLOGY

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## **CHAPTER 3**

### **BIOLOGY**

#### **310 INTRODUCTION**

This chapter presents a description of the biological resources found on the Dugout Canyon permit and adjacent areas. Additional information can be found in the following amendments: Methane Degassification Amendment (August 2003), Refuse Pile Amendment (February 2003), and the Leachfield Addendum A-1 (March 2001). The remainder of the State Lease ML-48435-OBA (SITLA Lease) was incorporated into the Dugout Canyon Mine permit area in 2005.

~~In 2007, 40 acres was added to Federal Coal Lease U-07064-027821 to accommodate a revised mine plan.~~ As clarification, in 2007 acreage (487.57 acres) was added to existing Federal Coal Lease U-07064-027821, two hundred and forty-seven acres of this added acreage is already included as part of the Dugout permitted area. Acreage was previously added to the permit area in excess of the Federal leased acreage to act as a subsidence buffer zone (207 acres) and to accommodate a revised mine plan (40 acres). In addition, State Lease ML-50582-OBA (320 acres, more or less) was issued to Dugout Canyon Mine in 2007. Future surface disturbance of these leases will be permitted as needed to facilitate mining activities. Refer to Plate 1-2 for the location of the acreage incorporated into the permit boundary.

The data used in preparation of this chapter have been gathered from the Sage Point-Dugout Canyon Mining and Reclamation Plan, Soldier Creek Coal Company Mining and Reclamation Plan, Environmental Research and Technology, Inc., Utah Division of Wildlife Resource (UDWR), Utah State Fish and Game, Eureka Energy Company (Nicolas Temnikov and Christopher A. Slaboszewicz), Soil Survey of Carbon Area, Utah, aerial photography, and Natural Gas Corporation of California.

#### **311 Vegetative, Fish and Wildlife Resources**

Vegetative, fish, and wildlife resource conditions in and adjacent to the proposed Dugout Canyon Mine are discussed in Section 320.

#### **312 Potential Impact to Vegetative, Fish and Wildlife Resources**

Potential impacts to vegetative, fish, and wildlife resources and the associated mitigation plan are presented in Sections 330 and 340 of this chapter.

### **313 Description of Reclamation Plan**

The reclamation plan used to restore the vegetative, fish and wildlife resources to a condition suitable for the postmining land use is presented in Section 340.

## **320 ENVIRONMENTAL DESCRIPTION**

### **321 Vegetation Information**

This section contains the environmental descriptions of the vegetation for the permit and adjacent areas.

#### **321.100 Plant Communities Within the Proposed Permit Area**

Vegetation communities of the permit area were first investigated by Dr. Steven Richardson of Logan, Utah during 1979. These studies encompassed the 22,506 acres of the formerly proposed Sage Point - Dugout Canyon permit area. Dr. Richardson's studies were subsequently upgraded in 1980 by Mr. Steven R. Viert and presented in the Sage Point - Dugout Canyon permit application submitted December 8, 1980 and approved by the Division in May, 1984 (Permit No. ACT/007/009). The vegetation designations used on Plate 3-1 are a combination of their studies, aerial photography, in association with the Soil Survey of Carbon Area, Utah and field verification.

Plate 3-1 has been prepared using the following vegetation designations:

Barren Ground	(B)
Douglas Fir	(DF)
Deciduous Streambank	(DS)
Farmland-Weeds	(FW)
Greasewood-Sagebrush	(GS)
High Shrubs	(HS)
Mixed Conifer	(MC)

Mixed Conifer-Mountain Brush	(MCMB)
Pinyon-Juniper	(PJ)
Ponderosa Pine	(PP)
Quaking Aspen	(QA)
Sagebrush	(S)
Shrub-Grass-Juniper	(SGJ)
Deciduous Stream Bank Vegetation	(DSR)
and limited riparian vegetation	
(Pace and Rock Creek)	

As discussed in the report prepared by Mt. Nebo Scientific, the Dugout Canyon disturbed area contains riparian, rabbitbrush/yellow sweet clover, and Pinyon/Juniper vegetation designations (see Appendix 3-1).

The dominant vegetation communities occurring in the area are somewhere below the climax stage of succession. Historic livestock grazing practices have caused a decline, or disappearance, of many naturally occurring species and their replacement by others (often noxious weeds). Over several years, this effect has altered the composition of the floral communities of the area.

Other impacts to the vegetation communities of the area have resulted from the previous construction of roads. Roads and trails tend to follow drainages and have thereby impacted the riparian, sagebrush, mountain brush, and coniferous communities. Weeds usually dominate the disturbed road banks. Mining facilities in Dugout Canyon constructed prior to the enactment of SMCRA displaced an additional small amount of native vegetation.

Baseline sampling by Dr. Richardson only occurred on five of the ten communities existing within the permit area. These five communities are Douglas Fir, Mixed Conifer, Pinyon-Juniper, Shrub-Grass-Juniper, and Deciduous Streambank. Quantitative descriptions of floral communities presented in this M&RP are based on the former Sage Point-Dugout Canyon permit document. Appendix 3-1 presents data for the vegetation communities discussed in this section. The adequacy of the sampling effort is indicated in Appendix 3-1.

The farmland-weeds vegetation type resulted from abandoned agricultural activities (due to lack of water) and is significant only from the standpoint that mule deer tend to feed on remaining alfalfa

during the spring green-up. It should be noted that none of this community occurs within the permit boundary.

Due to multiple consultants/companies gathering vegetation data, the following table has been provided to clarify the plant communities names used by each.

Sampling Organization	Plant Community			
	Riparian	Pinyon-Utah Juniper	Douglas-fir	Disturbed
Natural Resources Conservation Service	Riparian	Pinyon-Utah Juniper	Douglas-fir	Disturbed
Richardson/Viert Study	Deciduous Streambank	Pinyon-Juniper	Mixed Conifer and Douglas fir	N/A
Mt. Nebo Scientific Study	Riparian	Pinyon/Juniper	N/A	Rabbitbrush/ yellow sweet clover
Pat Johnston Study	Riparian	Pinyon/Utah Juniper	N/A	N/A

### Douglas Fir

The Douglas Fir community occurs on the north facing slopes at upper elevations in deeper productive soils. Floral and structural composition is that of a forest community consisting primarily of Douglas Fir with a few scattered Ponderosa pine, Rocky Mountain juniper, and quaking aspen trees in the overstory.

Ground cover of the overstory in the Douglas Fir community averages 65.0% and productivity of the trees was not determined. This community exhibits an average of 380.5 trees/ac comprised mainly of Douglas Fir (68.8% of all trees), Ponderosa pine (26.1%), and pinyon pine (4.1%). Examination of average basal diameters of the trees indicates a late-successional and mature community.

Ground cover of the understory is dominated by shrubs (18.4% cover), especially serviceberry, big sagebrush, snowberry, and creeping barberry with 4.2, 3.8, 3.8, and 2.5% cover, respectively. Grasses exhibit a sparse 0.8% cover while forbs only average 1.6% cover. Productivity of this understory totals 35.8 g/m<sup>2</sup> or approximately 320 lb/ac. Shrubs contribute 26.2 g/m<sup>2</sup> while grasses and forbs contribute 2.7 g/m<sup>2</sup> and 6.4 g/m<sup>2</sup>, respectively. Creeping barberry, mountain mahogany,



big sagebrush, and snowberry shrubs dominate with 7.7, 5.0, 4.9, and 4.9 g/m<sup>2</sup>, respectively. The adequacy of the sampling effort is indicated in Appendix 3-1.

#### Mixed Conifer

The mixed conifer vegetation type is an ecotonal community which occurs on the slopes of mid-elevational canyons that cut into the Book Cliffs. Floral and structural composition is that of a forest community consisting primarily of coniferous tree species in the overstory. These overstory tree species include Douglas Fir, Rocky Mountain maple, pinyon pine, and Utah juniper.

Ground cover of the overstory in the mixed conifer community averages 24.5% with Douglas Fir, Rocky Mountain juniper, and Rocky Mountain maple trees dominating with 10.0, 5.0 and 3.5% cover, respectively. Productivity of the trees was not determined; however, the community exhibits a density of 223.7 trees/ac. Examination of average basal diameters of the trees indicates a mid-to late-successional community with young Douglas Fir trees.

Ground cover of the understory is dominated by shrubs (11.5% cover), especially snowberry and big sagebrush with 4.5 and 3.5% cover, respectively. Grasses contribute another 4.5% cover, especially western wheatgrass (3.0% cover), while forbs exhibit only 2.5% cover. Productivity of this understory totals 38.5 g/m<sup>2</sup> or approximately 345 lbs/ac. Of this total, shrubs contribute 20.2 g/m<sup>2</sup>, grasses 4.9 g/m<sup>2</sup>, and forbs 13.1 g/m<sup>2</sup> with big sagebrush, Louisiana sagewort, and mountain mahogany dominating (7.7, 5.9, and 3.3 g/m<sup>2</sup>, respectively).

#### Pinyon - Juniper

The pinyon - juniper community is primarily an open woodland of mature pinyon pine and Utah juniper with very sparse understory vegetation. The community occurs mainly on mesa tops and broad alluvial deposits at the foot of the Book Cliffs, as well as on the more southern exposed slopes of the lower canyons. Pinyon - juniper is one of the most important vegetation communities for mule deer during the winter.

Ground cover of the overstory in the pinyon - juniper community averages 20.0% and productivity of the trees was not determined. This community exhibits an average of 291.1 trees/ac comprised entirely of pinyon pine (43.0% of the trees) and Utah juniper (57.0%). Examination of average basal diameters of the trees indicates a near climax mature community.



Ground cover of the sparse understory is dominated by shrubs (5.2% cover), especially by mountain mahogany with 2.5% cover. Cover by grasses was non-existent in the sampled areas and forbs only averaged 3.4% cover with euphorbia (spurge family) the dominant forb with 2.2% of the cover. The productivity of this understory is very light with only 3.3 g/m<sup>2</sup> (30 lbs/ac) of total annual production. Black sagebrush, mountain mahogany, and buckwheat were the dominant plants with 0.7, 0.5, and 0.5 g/m<sup>2</sup>, respectively.

The Pinyon-Utah Juniper community within the disturbed area boundary was surveyed during the Fall of 1997 by Patricia Johnston (see Appendix 3-1). During the survey the cover was 65.94%, with the woody species stems per acre being 2,334.4. George Cook of the Natural Resources Conservation Service (NRCS) surveyed the site to determine pre-mining productivity as defined in Item 4, Section IV, Productivity Measurements, UDOGM Vegetation Guidelines, Appendix A, February 1992. Productivity is discussed in Section 321.200.

#### Deciduous Streambank

The deciduous streambank community occurs only in a narrow band (usually less than 50 ft wide) along portions of Dugout Creek and other narrow valley bottoms with at least intermittent stream flows. This community differs from adjacent vegetation on canyon slopes (usually mixed conifer, Douglas fir, sagebrush, or mountain brush) in that deciduous trees and shrubs are more common on banks of stream channels. Floral and structural composition is that of a forest community consisting primarily of narrowleaf cottonwood, Rocky Mountain maple, and Douglas Fir trees in the overstory.

Total ground cover of the community averages 63.4% with 38.2, 14.6, 2.4, and 0.4% of the cover due to trees, shrubs, grasses, and forbs, respectively. Dominant trees in the overstory include Rocky Mountain maple, narrowleaf cottonwood, Douglas Fir, and water birch with 12.0, 11.3, 6.0, and 5.3% cover, respectively. Productivity of the overstory was not determined. However, the community exhibits an average of 216.1 trees/ac. Examination of average diameters of the trees indicates a mid- to late-successional community with only fair reproduction of the overstory species.

Ground cover of the understory is dominated by shrubs (14.6% cover), especially elderberry, snowberry and Wood's rose with 3.0, 3.0 and 2.7% cover, respectively. Cover by grasses (2.4%) and to a certain degree, forbs (8.2%), is subdued because of past grazing pressure by livestock,

but is still a viable component of the community. Productivity is known only for the community as a whole (102.5 g/m<sup>2</sup> or 912 lbs/ac), and despite past grazing pressures, it is still the most productive community in the area.

In Pace Creek and Rock Creek Canyons, heavy grazing and erosion has resulted in sections of the stream banks having little or no deciduous and/or riparian vegetation. The vegetation within these drainages has been identified on Plate 3-1 with the symbol DSR.

#### Riparian (1997)

During 1997 a study was performed on the riparian community of Dugout Creek by Patricia Johnston. The study covered approximately 2,100 feet of the creek channel. The study included the gathering of data on cover (84.83%) and woody species density (1,624.6 stems per acre) within the disturbed area boundary. George Cook of the Natural Resources Conservation Service surveyed the site to determine productivity and condition (see Section 321.200). Reports from Patricia Johnston and George Cook are included in Appendix 3-1.

The majority of the riparian vegetation and soils within the study area were disturbed during an earlier mining operation with debris evident along much of the length of Dugout Creek. As was common during early mining, the channel was most likely realigned as additional space for facilities was needed.

#### Shrub - Grass - Juniper

The shrub - grass - juniper vegetation type is another ecotonal community found between the greasewood - sagebrush and pinyon - juniper communities primarily on south and east facing steep rocky slopes along the base of the Book Cliffs. It can occasionally be found on upland benches and flats. This community exhibits a greater abundance of perennial grasses than any other vegetation type found within the area.

The shrub - grass - juniper community exhibits a sparse overstory of pinyon and juniper trees (2.9% ground cover) which at maturity do not obtain the size of the trees in the pinyon - juniper community. Density of these trees only averages 57.3 trees/ac, and productivity of this sparse overstory was not measured.

The understory of this community is dominated by grasses with 9.3% ground cover, while shrubs exhibit 6.4% cover and forbs exhibit a sparse 0.4% cover. Dominant species include creeping wildrye, galleta grass, and black sagebrush with 5.4, 3.2 and 4.6% cover, respectively. Productivity of this understory totals 59.3 g/m<sup>2</sup> or 528 lbs/ac with contributions by grasses, shrubs, and forbs of 40.9, 17.1, and 1.2 g/m<sup>2</sup>, respectively. Dominant plants are the same as indicated for ground cover.

#### Ponderosa Pine

Quantitative information for the Ponderosa pine community does not exist as it is too limited in areal extent and it has not been, nor will it be, disturbed by mine facilities. The community is present in the high canyons of the Book Cliffs usually in association with Douglas Fir and mixed conifer vegetation types. Ponderosa pine is the predominant species present; however, Douglas Fir, pinyon pine, and Utah juniper occur with less frequency. A thin growth of mountain shrubs as well as grasses and forbs similar to the mixed conifer community is present in the understory.

#### Quaking Aspen

Quantitative information about the aspen community was not collected due to its limited areal extent within the upland benches of the Book Cliffs; and because it has not been, nor will it be, disturbed by the mining operation. Quaking aspen is the dominant species in the overstory with an occasional Rocky Mountain maple or Gambel's oak being present. The understory is often park like, dominated by grasses and forbs with only a few shrubs present (mainly snowberry).

#### Sagebrush

The sagebrush community occurs on the dip slope between 7,200 and 9,000 feet in elevation. Quantitative information was not collected for this community as no mining disturbance has occurred in the past nor is expected to occur in the future. This community often intergrades with other communities, making delineation difficult in certain instances. However, big sagebrush (usually the subspecies mountain big sagebrush) is the dominant species in the community, existing in characteristically dense stands. Common species existing in the understory include lupines, wheatgrasses, bluegrasses, and scarlet gilia.

In 1996, the mean total living cover for the mine's disturbed area (Plate 3-1B) and reference area were 36.90% and 47.50% respectively (Mt. Nebo Scientific, August 1, 1996). The area surveyed by Mt. Nebo was disturbed in a previous mining operation, with no indication that reseeding was completed when mining ceased. NRCS range site descriptions/conditions indicate that the area (surveyed by Mt. Nebo) prior to disturbance was most likely Pinyon/Utah juniper - upland very steep shallow loam.

Refer to Appendix 3-1 for the 1996 Mt. Nebo report discussing the vegetation sampling done at the Dugout Canyon Mine site within the proposed disturbed area. The Mt. Nebo report discusses the vegetation cover, composition, density, reference area, and includes photographs of the transects and reference area.

#### Pace Canyon - Disturbed Pinyon Juniper

On August 13 - 14, 2003, quantitative and qualitative data were taken on the vegetation of the Pace Canyon fan portal area and it's reference area, by Mt. Nebo. The transect placement technique was employed with the goal to adequately sample a representative subset of the site. The mean total living cover of the vegetation for the site was estimated at 52.50%, 44.67% of this total was from the understory and 7.83% was overstory. Pinyon pine and Utah juniper were the most common species in the overstory, big sagebrush was the most common woody species in the understory. The site had a host of forbs, nearly all of which were annual exotics or weedy species (most common was poverty weed). The only grass species inventoried was cheatgrass. The majority of the site has been previously disturbed by various activities, such as road construction, logging, exploration and mining. Refer to Appendix 3-4 for a copy of the Mt. Nebo report.

#### Federal Coal Lease U-07064-027821 and State Lease ML-50582-OBA

40 Acres - Federal Coal Lease U-07064-027821 Although, Plate 3-1 shows the area within T13SR13E, Section 21, NW1/4NW1/4 to be sagebrush the following descriptions are from examination of an aerial photograph taken November 2006. NW1/4NW1/4NW1/4 is sagebrush, with some scattered juniper throughout, SW1/4NW1/4NW1/4 is sagebrush in the center, with Douglas fir, juniper and pinion pine on the outside edges on the east and west, SE1/4NW1/4NW1/4 is sagebrush and quaking aspen with Douglas fir, juniper and pinion pine on the outside edges on the west and north. SE1/4NW1/4NW1/4 is approximately 30% disturbed and the

NE1/4NW1/4NW1/4 is approximately 50% disturbed by roads and logging. In the NE1/4NW1/4NW1/4 the west half is sagebrush and the east half is quaking aspen, Douglas fir, juniper and pinion pine. A spring in the NE1/4NE1/4NW1/4NW1/4, likely has a limited riparian vegetation community associated with it, the limiting factor would be the flow which has been measured at a maximum of 1 gpm and a minimum of 0.25 gpm (Appendix 7-2). On September 3, 2007 this spring was dry. The spring is located over an area where minimal subsidence is anticipated (Appendix 5-12, see figure entitled "Potential Subsidence....."). The locations of the vegetation described are approximate.

The vegetation areas shown on Plate 3-1 have been extended or revised in T13S R13E, Sections 8, 9, 15, 16 and 21 to include the additional acreage in leases U-07064-027821 and ML-50582-OBA. The vegetation information was taken from aerial photographs taken in November of 2006. Areas within these leases have been disturbed by logging, fences, trails and roads.

### **321.200 Land Productivity Prior to Mining**

The land productivity of the area to be disturbed by mining was not measured in 1925 when mining first disturbed the area. Appendix 3-1 contains additional data pertaining to vegetation.

George S. Cook of the NRCS surveyed the condition and production of the range site areas within the disturbed area boundary in 1997, his findings were as follows:

PJ Sage	Condition - Good	Production - 800	Potential Production - 800
Riparian	Condition - Fair	Production - 1500	Potential Production - 2200

The production is based on air dry weight of total herbage produced per acre. Patricia Johnston accompanied Mr. Cook. See Appendix 3-1 for a copy of the December 3, 1997 letter from Mr. Cook.

#### **Pace Canyon - Disturbed PJ**

Since the site was previously disturbed, production estimates were provided by Dean Stacy of the NRCS (Natural Resources Conservation Service). A letter and attachments from Mr. Stacy are included in Appendix 3-4. Production estimates for High Mountain Loam with west facing slopes for a normal year with medium cover was 600, eastern facing slope with Upland very steep stony



loam was estimated at 550 annual production. Mt. Nebo estimated the total woody species density at the Pace Canyon site to be 444.

### **322 Fish and Wildlife Information**

A summary of the fish and wildlife resource information for the permit and adjacent areas is contained in Sections 322.100 through 322.300. The data pertaining to wildlife in the following sections were collected by the UDWR (J. S. Burruss, L. B. Dalton, Larry J. Wilson, Ben Morris, Bill Bates, etc.), Eureka Energy Company personnel, EIS Environmental and Engineering Consulting and Environmental Research and Technology, Inc.

#### **322.100 Level of Detail**

The scope and level of detail within this M&RP are sufficient to design the protection and enhancement plan for wildlife and fish in the area.

This assessment of wildlife resources has been compiled pursuant to guidelines issued by the Division.

#### **322.200 Site-specific Resource Information**

Eight permanent experimental and four permanent control wildlife transects were established in the permit and adjacent areas by UDWR in December 1979. Appendix 3-2 contains a figure showing the transect locations. The transects were located within pinyon-juniper, desert shrub, and mixed conifer vegetation communities; and used to monitor wildlife habitats. The wildlife habitats included in the study were small mammals, medium-sized mammals, large mammals, raptors, game birds, song birds, reptiles, and amphibians. The four permanent control transects were located in areas not proposed for disturbance by mining operations. Appendix 3-2 contains the information pertaining to the transect studies.

##### Macroinvertebrates and Fish

Due to the variable nature of the stream flows in the project area and the limited number of species of macroinvertebrates identified by the UDWR and the Division, further study of aquatic macroinvertebrates was not pursued.

The low importance of the streams, as a fishery resource, has categorized them as being of little value for extensive aquatic study. Therefore, detailed aquatic studies were not performed on Dugout Creek in accordance with permission from the Division in 1979 (see letter from Mary Ann Wright, Appendix 3-3).

#### Small Mammals

Small mammals represent a significant part of the ecosystem. The majority are herbivores and are the primary source of food for higher trophic levels, particularly raptorial birds, canids, and felids. Small mammals, including shrews, mice, voles, chipmunks, and ground squirrels were sampled with live traplines within each transect. Relative abundance was determined for each species by transect, but not by habitat type, within the individual transects. Data concerning bats were not collected during this study, however a bat survey of the riparian and disturbed area in Dugout Canyon was performed in 1997 by Mark Perkins and included in Appendix 3-3.

#### Medium Mammals

The transect study did not attempt to make density estimates due to the extreme ecological variability of these mammals. The study did identify species and frequency of habitat use in the area.

Limited portions of Dugout Canyon provide habitats for weasels, badgers, and skunks. Even though the breeding and rearing activities of these non-migratory species and their dens and burrow systems are important to maintenance of their populations, the area to be disturbed is small and the species are widespread and adapt easily to the activities of man.

#### Large Mammals

Habitat use by all large mammals, other than mule deer, was determined in a quantitative manner. Plate 3-2 (confidential) exhibits the significant habitat for mule deer and elk in the area. Habitat use

in the proximity of the permit area was determined by pellet group count and observation of track frequency. Pellet counts were made in late spring, following movement to summer range. Track counts were made once each month in January through May on all transects.

The area to be disturbed parallels a water source and therefore is important to all wildlife species. The fact that elk and deer utilize some portion of the permit area during the year means that all activities must be considered.

Mule deer on the mine area are considered by the UDWR to be part of Herd Unit 32 and the elk as part of Herd Unit 24. The deer utilize the entire permit area but seasonally concentrate in and utilize specific habitat types. During the summer the mule deer generally utilize all of the habitats near water. The most heavily used communities are the sage, mountain brush-mixed conifer, and the composite of aspen, mountain mahogany, manzanita, and pine/fir. There is normally more browse in these communities than in the others.

With the onset of fall and winter, the mule deer latitudinally migrate. Initially (late fall and early winter) they concentrate on the plateau area where they intermingle with the elk; but when the snow gets too deep for them to traverse they move into the low elevation sage and pinyon-juniper areas. The wintering areas for mule deer make them susceptible to road strikes in the vicinity of the proposed haul and access road for the Dugout Canyon Mine. The access roads to Pace and Rock Canyon crosses area used by deer as winter range, however traffic is sporadic during the winter months and heavier during the summer and fall months.

### Raptors

Golden eagles are a common year long resident of the area, with suitable nesting habitat spread throughout the permit area. The cooper's hawk is known to nest in the permit area.

A variety of falcons are year long residents of the area, utilizing cliffs for their nests. To date there are no known aerie sites for falcons within or immediately adjacent to the disturbed area.

Raptors were studied during the 1979 - 1980 UDWR transect study, in 1981 by Janet Lee Young and by Hayden-Wing Associates in 1984. These reports are provided in Appendix 3-3.



Raptor nest surveys were done by the UDWR in 1995, 1997, 1998, and 1999. The nest locations identified in 1997 and 1998 are shown on Plate 3-2 in the mine's UDOGM confidential folder (confidentiality required by UDWR). All nests located in the 1997 survey were cliff nests (Ben Morris, UDWR, January 20, 1998). All nests located in the 1998 and 1999 surveys were cliff nests.

#### Migratory and Song Birds

Birds were studied during the 1979 - 1980 UDWR transect study. However, a more extensive study was done by Hayden-Wing Associates in 1984. Their report can be found in Appendix 3-3.

#### Reptiles and Amphibians

Increasing elevation rapidly reduces the number and kind of reptiles and amphibians. Furthermore, in Utah the effects of the more northern latitude reduces the number of herptiles in much the same way as does the increase in elevation.

These geographical and associated climatic factors have eliminated most desert species, leaving species that are adapted either to mountain habitats or montane type habitats. Based on extensive literature review and limited field work, it was determined that potentially 8 species of amphibians and 18 species of reptiles inhabit the area. Of these species only 5 were recorded by the UDWR in 1980: Eastern fence lizard, Sagebrush lizard, Tree lizard, Short-horned lizard, and the Gopher snake. A WESTECH biologist observed two other species in 1979, the Western whiptail and the Midget faded rattlesnake. All amphibians and reptiles are legally protected, but since the species listed are all widespread throughout the mountains of Utah, none are treated as high-interest species. It is doubtful that the proposed action would seriously impact populations, but localized individuals may be involved in habitat destruction due to subsidence. An exception to this would be if subsidence caused drying of present wet habitats essential to reproduction. Refer to Section 332 for a discussion of "Possible Short-Term and Long Term Impacts to Species Dependent on Springs, Creeks and Drainages".

#### Pace Canyon

Wildlife indigenous to the general area of the project include amphibians, reptiles, birds and mammals. A copy of the 2004 raptor survey map for the area is included in the 2004 Annual

Report. Calling surveys of the area were also done in 2003 and 2004 for the Mexican spotted owl (Appendix 3-3).

Amphibians - There are six common species of amphibians known to occur within the general area (mesic area). These species could be present within the Pace Canyon area, but their occurrence is doubtful due to arid conditions that prevail over the majority of the area.

Reptiles - There are ten species of reptiles known to inhabit the region. The limited acreage of disturbance, however, should not be considered a threat to these species, due to the abundance of pinyon and juniper habitat, as well as sagebrush and grass habitat throughout the area.

Birds - There are approximately 185 bird species that could either be potential yearlong residents or frequent the site during portions of the year. Of these, loggerhead shrike (BLM Sensitive species) and raptors are discussed below.

A survey of the fan portal area indicated no nesting loggerhead shrikes, *Lanius ludovicianus*, near the proposed roads. This species is dependent upon the broad, open sagebrush and grass plain, as well as the presence of widely spaced pinyons and junipers. A summary of the inventory conducted for this species and a negative determination of its presence is included in Appendix 3-4 (BLM EA, UT-070-2003-55).

Raptor surveys, completed in May of 2004 by the UDWR, revealed a number of raptor nest sites on the open lower benches and cliff faces in and surrounding Pace Canyon. Two inactive golden eagles (*Aquila chrysaetos*) nests on the outer edge of one mile radius from the fan site were inventoried in 2004 (Section 24, R12E T13S) and two potential raven nests were located in previous years in Section 23, R12E T13S.

The 2004 spring inventory identified no active and or tended Golden Eagle nests within a 1/4 mile of the proposed site. An inventory in 2002, 2003 and 2004 for Mexican Spotted owl and Goshawk did not reveal the presence of these species within the fan project area.

Mammals - Ninety-two (92) species of mammals have the potential to inhabit the region. Of these, the following species; mule deer, *Odocoileus hemionus*, elk, *Cervus elaphus* and pronghorn antelope, *Antilocapra americana*, have been identified to live within or adjacent to the affected area.

As shown on Plate 3-2, the area of the fan site is designated summer range for mule deer and year-long range for elk.

Pronghorn antelope occupy the salt desert shrub habitat of the lower elevation ranges along the Clark Valley Road. This habitat is classified as high priority year-long range for pronghorn.

**Threatened and Endangered Plant and Wildlife Species.** Passage of the Endangered Species Act of 1973 (Public Law 23-20S) provided the legal basis for establishment of lists of endangered and threatened plant and wildlife species ( Appendix 3-3).

Although three species (black-footed ferret, bald eagle, and peregrine falcon) on the list could potentially inhabit the area, an inventory of endangered wildlife species performed in 1979 by the UDWR recorded no threatened and endangered species within the proposed permit area. No confirmed sightings of black-footed ferrets have occurred within Carbon County during 1995, 1996, and the first quarter of 1997, however bald eagles have been seen flying in the vicinity of the mine (Bill Bates, UDWR).

A literature review and field studies for both the Soldier Canyon and the Sage Point - Dugout Canyon permit documents were performed to assess the possible presence of any threatened, endangered, or sensitive plant and wildlife species in the respective permit and adjacent areas.

These study areas included the proposed Dugout Canyon disturbed area. The literature review indicated that no species listed (or proposed as candidates) by the U.S. Fish and Wildlife Service (FWS) as threatened or endangered were likely to inhabit the area. In addition, the field investigations which occurred in 1979, 1980, 1983, and 1984 did not identify or locate any threatened or endangered species. No threatened or endangered plant species including Canyon sweetvetch were found within the disturbed area by Robert Thompson during his 1995 survey (see Robert Thompson letter, Appendix 3-1). Mr. Thompson is qualified and has performed threatened and endangered surveys for the U.S. Forest Service.

As reported in the 1997 bat survey "we noted no suitable habitat, did not record via detectors or capture, or note by indicators presence of *Corynorhinus townsendii*. It is our opinion the bat does not occur in the immediate vicinity of the proposed disturbance area. We also did not note suitable

## Windy Gap Process as it Applies to Existing Coal Mines in the Upper Colorado River Basin

### Mining Consumption:

**Estimated Purchased Gallons/yr: 1,003,200**

29,354 gallons/day (3/05/04 ventilation survey)

44,000 gallons/day (9/13/04 ventilation survey)

$$73,354 \times 0.5 = 36,677 \text{ gallons/day (survey average)}$$
$$36,677 \times 365 = 13,387,105 \text{ gallons/yr}$$

Water added to coal produced - 4.03% inherent moisture - source Dugout Geologist  
5.80% run-of-mine moisture - year to date average  
1.77% moisture added to coal by cutting operation

Projected Tonnage 2004	4,245,737 tons
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Projected Tonnage 6 year average	4,369,084 tons
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Tons water/yr 77,333

Pounds water/yr	154,665,562
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Gallons water/yr	18,522,822
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Mine Site Pond	0.107 acres (surface area) 18.1 in/yr (high estimate based on HCI Technical Memo, August 22, 2002) 0.16 ac/ft 7030 gallons/yr
Refuse Pile Pond	0.41 acres (surface area) 9 in/yr 0.31 ac/ft 5612 gallons/yr (five month period, high estimate)

## 3-17

Alluvial Aquifer Abstractions into Mines - Not Applicable

Alluvial Well Pumpage - Not Applicable

Deep Aquifer Pumpage - Not Applicable

Postmining Inflow to Workings - Not Applicable

Direct Diversions: - Not Applicable

Dust Suppression - 3,500 gallons per truck load, 3 loads per day, for 30 days = 315,000 gallons plus 3,000 per truck load, 1.25 loads per day, for 45 days = 168,750. Total: 483,750 gallons per year.

Mine Discharge: 6 Month Average 362,118 gpd = 132,172,948 gal/yr

Calculation estimates for water use in 2004 were necessary since we are using 2004 purchases and usage and the year is 2 months short.

#### Pace Canyon

"In accordance with the United States Fish and Wildlife Service's (USFWS) protocols, and inventory for the presence of threatened, endangered, and sensitive fauna and floral species was conducted on August 13, 14, and September 29, 2003. Loggerhead, shrike, burrowing owl, Northern Goshawk, Despain foot cactus, Wright fishhook cactus and Creutzfeldt cryptantha and neo-tropical migratory birds were the sensitive species of concern within the area. A thorough search of all seven well sites and associated access roads did not reveal the presence of these species (BLM, Environmental Assessment, UT-070-2003-55)." A map of the area inventoried is provided in Appendix 3-4 within the referenced environmental assessment, it should be noted that the area covered by the aforementioned environmental assessment is the same area proposed for the construction of the Pace Canyon fan facilities. In addition a sensitive plant species survey was conducted by Mt. Nebo in August 2003. To initiate the study, appropriate agencies were consulted (e.g. Utah Natural Heritage Program) and other sources were reviewed for potential plant species that are known to be rare, endemic, threatened, endangered or otherwise sensitive in the area of study. The only plant identified was canyon sweetvetch. No rare, endemic, threatened, endangered or otherwise sensitive species were found in the area proposed for disturbance.

Federal Coal Lease U-07064-027821 and State Lease ML-50582-OBA

On January 19, 2007 Division of Wildlife Resources (DWR) personnel were contacted concerning the addition of approximately 600 acres to the permit area of the Dugout Canyon Mine. Dugout



personnel met with Mr. Wright at the DWR office in Price, Utah. Mr. Wright had requested that the mine provide their most recent aerial photography for his review of the areas for the existence of threatened and endangered wildlife species. Mr. Wright also reviewed other information, maps and aerial photographs owned by the DWR. Mr. Wright recommended a goshawk survey be done if surface disturbance is planned for a mature stand of firs in W1/2NW1/4NW1/4 of Section 21 and at a mature stand of firs in N1/2NE1/4 of Section 17.

Using the Utah Conservation Data Center repository web site (<http://dwrcdc.nr.utah.gov/ucdc/>) the leased areas were researched to identify known locations of threatened and endangered plant and wildlife species, no locations were found within the leased areas.

Lease Modification U-07064-027821 Tony Wright and Leroy Mead of the Division of Wildlife Resources (DWR) were contacted on January 19, 2007 to determine the potential for threatened or endangered wildlife species to be present within the proposed lease modification area (NW1/4NW1/4 Section 21, Township 13S, Range 13 East). Tony Wright reviewed an aerial photograph of the area on January 19<sup>th</sup> and Leroy Mead had visited the area in November 2006. Mr. Wright said there was potential for goshawks (species of concern for the DWR) to be in the general area describing their habitat as mature ponderosa pines or stands of mature firs. The 40 acre modification has a stand of mature firs which was identified by Mr. Wright as potential habitat for goshawks. Mr. Wright recommended a goshawk survey be done if surface disturbance is planned for the mature stand of firs in W1/2NW1/4NW1/4 of Section 21. Mr. Wright also identified a potential mature stand of firs in N1/2NE1/4 of Section 17.

No threatened or endangered wildlife species were identified as being in the area (Leases U-07064-027821 and ML-50582-OBA) by either Mr. Wright or Mr. Mead. Mr. Wright consulted several sources before determining the lack of threatened and endangered species in the area. Mr. Wright inquired if there were any large ponds of water that would be impacted by disturbance within the lease modification area, the permittee is unaware of any large ponds within the proposed lease modification area.

Patrick Collins of Mt. Nebo Scientific was contacted on January 19, 2007 to determine if threatened or endangered plant species were known to be present within the ~~proposed lease modification~~ area. Mr. Collins visited the lease modification area in November 2006, at the time no threatened or endangered plant species were located. Appropriate agencies were consulted (e.g. Utah Natural

Heritage Program) and other sources were reviewed for potential plant species that are known to be rare, endemic, threatened, endangered or otherwise sensitive in the lease modification area. A description of the research performed by Mt. Nebo Scientific and the conclusions are included in Appendix 3-1 (NW1/4NW1/4 Section 21, Township 13S, Range 13 East).

**Habitats of Unusually High Value.** High value habitats in Dugout Canyon include the riparian area and the cliff escarpments. Major portions of established habitat will not be disturbed, but the restricted access by wildlife to the water source within the area of disturbance could displace wildlife. The cliff areas adjacent to the disturbed area could harbor mountain lion, bobcat and bear; and with increased activity and noise they may avoid the area. Elk and deer who may frequent Dugout Canyon will likely avoid the area during the heaviest of activity, but resume their normal patterns once they become accustomed to it.

In a letter dated April 22, 1996 to James W. Carter the director of UDOGM, Robert G. Valentine director of the UDWR makes the following comment "much of the area is classified as critical deer winter range and is heavily used by deer and occasionally by elk and antelope". Use classification drawings of the Dugout Canyon area for large mammals (deer, elk, antelope, etc.) were requested from the UDWR in January of 1996 by SCM. The cover letter dated January 30, 1996 from the UDWR and the drawings are included in Appendix 3-3 for interpretation by UDOGM. SCM has interpreted and transferred the information (provided by UDWR) to Plate 3-2. The use classifications were extended on Plate 3-2 with the incorporation of Federal Lease U-07064-027821.

A survey for bats was performed by Mark Perkins in September of 1997. A report of this survey is included in Appendix 3-3 with a figure showing the bat survey locations.

No data or definition was available to determine the criteria for an area to be classified as of "unusually high value" for bats. However, since extensive rock faces, cliffs, and escarpments are present throughout the Book Cliffs Region, the land within the permit boundary is not unusual or unique to the area. The Castlegate Sandstone, Blackhawk, and Price River are the cliff forming formations present in the Dugout Canyon area. Refer to Chapter 6 for descriptions of these formations and Plate 3-3 for their locations.

In the Perkins-Dugout Mine Bat Survey the following statement was made "development plans for the proposed disturbance area contains some mitigation for resident bat species. A proposed runoff pond will likely provide accessible year round water and an associated bio-mass. Presently Dugout Creek is not classified as a perennial stream. In addition, plans include several outdoor flood lights which may act as an attractant for phototropic insects and provide a concentrated and stable food resource for local bat populations. Due to no cliff subsidence and mitigating actions noted above, it is our opinion that excepting the disturbance to and removal of 2,000 ft. of riparian zone, impact (either positive or negative) on local bat populations is minimal".

#### Raptor and Bat Survey

Raptor nest surveys will be conducted annually in the Spring prior to mining activities or potential subsidence within the permit area and in proposed expansion areas to the permit to obtain base line data. In addition, raptor nest locations will be monitored/surveyed the year following the first monitoring/survey if nests were observed during the survey and if operations result in subsidence. The permittee will contact the Division prior to any raptor nest protection efforts.

A bat survey for Utah sensitive bat species is planned for 2005 (May thru September), this survey will cover the cliff areas adjacent to a proposed fan breakout in Pace Canyon. Baseline bat surveys of Utah sensitive bat species will be conducted between May and September in riparian habitat expected to be impacted by subsidence. In addition, Utah sensitive bat species will be monitored/surveyed the year following the first monitoring/survey if Utah sensitive bat species were observed during the survey and if mining operations result in subsidence impact to the riparian habitat.

On the nights of May 21 and 22, 2007 JBR Environmental Consultants, Inc conducted bat surveys along the northern cliffs of Pace Creek Canyon. The inventory area of the survey included portions of Sections 16, 17, 18, 19, 20 and 21 T13SR13E. During the two night of recording bat calls, no bat call files were produced (Attachment 3-2).

#### Federal Coal Lease U-07064-027821 and State Lease ML-50582-OBA

The area was included in the areas requested to be surveyed by the DWR during the 2006 and 2007 raptor surveys. Raven nests were the only nests active during the 2007 survey of the leased



areas. A raptor survey of the leased areas will continue on an annual basis until mining in the area is discontinued. Due to the limited size of disturbance within the area of the leases, impacts to "Habitats of Unusually High Value" will be minimal.

40 Acres - Federal Coal Lease U-07064-027821 The 40 acres was included in the 2006 raptor survey performed by the DWR and will continue to be included on an annual basis until mining in the area is discontinued.

Tony Wright of DWR and Jerriann Ernstsens of UDOGM had a conversation on March 6, 2007, per a message from Ms. Ernstsens left on the phone of Vicky Miller, Dugout Canyon Mine's Environmental Engineer. According to Ms. Ernstsens, the conversation concerned bat habitat on the 40 acres described as NW1/4NW1/4 Section 21, Township 13S, Range 13 East. Mr. Wright stated in the conversation between himself and Ms. Ernstsens that he was not concerned with the loss or impact to bat habitat in the area described except for the loss of a water source, a spring in the NE1/4NE1/4NW1/4 of Section 21, T13S, R13E. The spring (groundwater monitoring location 259A (Plate 7-1), added in 2007 in conjunction with the 40 acre permit area expansion, Task ID #2743) is located over an area where minimal subsidence is anticipated. To the best of the permittee's knowledge and understanding the 40 acre permit area expansion does not require a bat survey.

During June of 2005 the bat survey performed by JBR consultants, Pace Creek was surveyed. Site/stop #7 was in the S1/2SW1/4 of Section 21, Appendix 3-3 of M&RP, Figure 1, this stop was the closest to the proposed 40 acres. In the summary of the report it states "the nearly constant bat activity at the Stop #7 pond suggests that this water feature is an important resource for bats in terms of both water and feeding." The pond will not be effected by the mining proposed in the NW1/4NW1/4 Section 21, Township 13S, Range 13 East, (40 Acre addition to Federal Coal Lease U-07064-027821), but according to the JBR consultants is likely the water source used by the bats in the area.

#### Replacement

Since water and its corresponding vegetation are important throughout the state of Utah, regulatory agencies have been requiring mitigation for disturbance and eventual replacement from the coal

industry. SCM will comply with the requirements of mitigation and eventual replacement of the resources which may be lost or disturbed during this mining operation, refer to Sections 331, 340, 350, and 762.100.

As a mitigation effort SCM replanted 7,500 feet of disturbed riparian streambank above the northern disturbed area boundary with a modified version of Seed Mix No. 1 (mitigation seed mix), to assist in restoring vegetation which has been disturbed by the logging industry.

**Mitigation Seed Mix (Hydroseed/Broadcast Quantities)**

<u>SPECIES</u>	<u># pls/acre</u>
Bluebunch wheatgrass	5.0
Intermediate wheatgrass	5.0
Slender wheatgrass	5.0
Smooth brome	5.0
Indian ricegrass	3.0
Blueleaf aster	1.0
Blue flax	1.5
Northern sweetvetch	1.5
Mountain big sagebrush	1.0
TOTAL	28.0

Willows were transplanted along the edges of the stream channel above the mine site disturbed area, with the mitigation seed mix being planted from the east edge of the stream channel to the outside edge of the logging road cut. The area between the edge of the stream channel and road cut varies from 10 to 45 feet as it travels the 7,500 feet planned for replanting. The west side of the channel was not disturbed by logging. For clarification the stream channel changes to the west side of the road upstream from the disturbed area boundary.

Due to the steepness and roughness of the slope the area was hydroseeded. The mitigation seed mix (listed above) was sprayed using hydroseeding equipment over the mitigation area. A second pass of the hydroseeding equipment sprayed the mulch/tackifier on top of the previously sprayed seed mix. Two thousand pounds per acre of the Division approved (Appendix 3-1) wood fiber mulch (Ecofiber, trade name) were used on the mitigation area. The seeding and planting was completed during 1998.

Additional mitigation for disturbance is being done to comply with the requirements of the UDWR. The mitigation included the cutting of grown pinyon and juniper trees to improve the growth of the understory adjacent to the Nine Mile Canyon Road. These mitigation efforts are being coordinated directly with the UDWR.

SCM will plant approximately 4,000 willows including both the mitigation described previously and during final reclamation. A portion of the willows were planted during the spring of 1998 to satisfy the mitigation commitment. Willows were planted wherever the channel afforded sufficient space. The channel above the mine site is covered with rock slides in several stretches of approximately 100 feet each. Additional willows will be planted to complete the commitment, however the numbers being planted may decrease since it was discovered during the Spring planting that the channel affords a limited environment for willows. CFC has discussed this matter with Paul Baker of UDOGM and a commitment made by CFC to continue to keep UDOGM involved in the mitigation process. Paul Baker was contacted in 2001 concerning the progression of the willows planted, photographs were taken and forwarded to Mr. Baker for his review. Survival rate for the willows planted was estimated at 75%.

During a site visit in December of 1997, Bill Bates of the UDWR requested that the riparian mitigation include the installation of habitat/stability enhancement structures within Dugout Creek upstream from the proposed disturbed area. SCM commits to the installation of structures similar to those identified in Figure 7-12 should all regulatory agencies and SCM be in agreement. The location and type of structure will be correlated with UDWR, U.S. Fish and Wildlife Service, and the Division.

#### Pace Canyon

Due to the limited size of disturbance associated with the fan portal facilities, impacts to "Habitats of Unusually High Value" will be minimal.

#### **322.300 Fish and Wildlife Service Review**

If requested, SCM authorizes the release of information pertaining to Section 322 and 333 to the U.S. Fish and Wildlife Service Regional and Field office for their review.

### **323 Maps and Aerial Photographs**

The permit area was mapped by use of a mosaic of aerial photographs and assured by ground inspection in some areas. Maps are contained within the reports provided in Appendices 3-1, 3-2 and 3-3.

During a meeting with the UDWR on January 20, 1998 Ben Morris requested that "the nest locations and related data gathered in the 1997 raptor survey of the Dugout Canyon Mine area be kept confidential". Therefore this survey will not be discussed or presented in this permit document, but can be reviewed by Division personnel within the Dugout Canyon Mine "confidential binder". The confidential binder contains Plate 3-2 which shows the location of nests found during the raptor surveys conducted by UDWR. In a Technical Analysis (Task ID #1915) for the inclusion of the SITLA Lease into the permitted area, instructions were given by UDOGM personnel to remove this information from the confidential folder and include it in the M&RP. This information is currently contained in Appendix 3-3.

Vegetation drawings and appendices within the permit area not included in the M&RP are included in the following amendments:

#### Refuse Pile Amendment

RA Figure 3-1 Surrounding Representative Vegetation Communities  
RA Figure 3-2 Vegetation at Site Prior to Mining Disturbance  
RA Attachment 3-1 Vegetation Data

#### Methane Degassification Amendment

Figure 3-1 Vegetation Reference Areas  
Figure 3-2 Adjacent Vegetation  
Attachment 3-1 Vegetation Inventory

### **323.100 Location and Boundary of Proposed Reference Area**

SCM will use range sites as described and designated by the NRCS Range Handbook and the UDOGM Vegetation Guidelines. Further description can be found in Section 356.100.

Mt. Nebo Scientific did sample a reference area during its 1996 vegetation survey, however SCM does not currently plan to use this data. Reference area(s) are not designated on any plate or figure within this M&RP, except as noted in Section 323.

#### Pace Canyon

The reference area for the fan facilities is shown on Plate 3-1E. The reference area was inventoried by Mt. Nebo Scientific in August of 2003 (Appendix 3-4). The total living cover was 57.43%, of which 26% was overstory and 31.43% was understory species. The most common overstory species were Douglas fir, Utah juniper and pinyon pine. The most common understory species was big sagebrush, with other native perennial species including Indian ricegrass and Salina wildrye. Species composition calculations reveal that woody species comprise 61.16% of the living understory cover, followed by grasses (33.36%) and forbs (5.47%). The number of woody species in the density measurements was estimated at 2,145 individuals per acre.

### **323.200 Elevations and Locations of Monitoring Stations**

Raptor nest locations and elk and deer range are shown on Plate 3-2. The permit area contains no fish monitoring stations.

### **323.300 Facilities for Protection and Enhancement**

Sections 333.300 and 358.500 contain additional discussion pertaining to protective measures to be taken by SCM in behalf of wildlife.

### **323.400 Vegetation Type and Plant Communities**

Vegetative types and plant communities are outlined on Plate 3-1 and 3-1A of this application.

Vegetation types and plant communities on Plate 3-1 were interpreted directly from aerial .photographs except for selected areas. The inclusion of small vegetation units was limited and included the exclusion of small, long or narrow units of vegetation within other units. Vegetation depicted on Plate 3-1A represents vegetation ground surveyed and identified in the field.

Additional information pertaining to vegetation type and plant communities in Pace Canyon is provided in Appendix 3-4.

### **330 OPERATION PLAN**

#### **331 Measures Taken to Disturb the Smallest Practicable Area**

No vegetative disturbance is anticipated beyond that encountered during construction of the surface facilities and fan facilities. The area to be disturbed by operational facilities will be kept to a minimum. Only facilities required to maintain the coal operation or satisfy environmental or safety requirements will be built.

Disturbed areas will be seeded with a mixture which will meet the requirements necessary to stabilize and provide cover; and with sufficient production and diversity characteristic to satisfy regulatory requirements.

Sections 341 describes the seed mixes to be used in both interim and final reclamation of the disturbed areas. For both the interim and final reclamation mixes, the vegetation data were evaluated to determine seed mixture constituents in light of production, cover, and diversity requirements. The soils report was reviewed to select species adapted to the soil's physical and chemical condition. Plant species were selected on the basis of wildlife needs and requirements. In addition, the operations plan was reviewed to determine the need for species with quick establishment, rapid spreading, and high erosion control potentials.

#### **332 Description of Anticipated Impacts of Subsidence**

Subsidence and its anticipated impacts are discussed in Sections 333 and 525 of this M&RP.

The potential effects of subsidence on nests could be one or several of the following:

- Displacement and relocation of nesting raptor(s)/birds,
- Injury to or death of nest inhabitants,
- Nest destruction.



Subterranean changes caused by subsidence to wildlife habitat is not currently understood. Subsidence could disrupt burrow systems destroying the home and habitat of burrowing mammals, reptiles, and amphibians and possibly cause death to some species in the immediate area. Since subsidence occurs systematically and in small areas at a given time, only localized populations will be impacted and only for a short period of time. Reproductive potential coupled with dispersal will facilitate recovery and negate the temporary population reduction.

Possible Short-Term and Long Term Impacts to Species Dependent on Springs, Creeks and Drainages

Impact to species dependent on springs, creeks and drainages could include disturbance of shelter, food, increased evaporation, rise and/or decrease in water temperature, water flow, and bank stability. Most species of wildlife are highly adaptable, while others with limited mobility are not. The mollusk (*Physella virgata*) and tiger salamander, mentioned in the TA on Task ID #1915) are dependent on water resources and may have been impacted by the drought conditions in Utah since 1999. Studies have shown that when habitat changes amphibians have either died or have moved to locations where water and habitat are more abundant. If they have moved, then should their habitat change again, they will likely move to a more suitable area..(Joseph M. Kiesecker - Dept. Of Biology, Pennsylvania State University; Andrew R. Blaustein and Lisa K. Belden - Dept. of Zoology, Oregon State University; Global Amphibian Assessment, Amphibia Web [AmphibiaWeb](http://elib.cs.berkeley.edu) (<http://elib.cs.berkeley.edu>; Alex Kirby, BBC News Online "Global amphibians in deep trouble" October 14, 2004; U.S. Water News Online, "Georgia drought harming wetland species" January 2002; UPI Science News, "Wildlife suffering from record drought" 8/30/02). There have been no impacts identified to springs, creeks or drainages within the Dugout Mine permitted area. Subsidence could in the future impact mullusk and salamander individuals. In the event of subsidence-related impact, the subsidence plan details measure that should repair material damage, including habitat for the state-listed sensitive mollusk and salamander species.

It is anticipated that streams within the permit area will not be significantly impacted as discussed in Chapter 5, Section 525.100. Interruptions of flow within perennial, intermittant, and ephemeral



streams is not anticipated. Therefore, flows sustaining riparian and stream bank vegetation should continue during and after subsidence. Refer to Section 731.200 for a proposed monitoring and mitigation plan.

### **333 Plan to Minimize Disturbances and Adverse Impacts**

General control and mitigation measures addressing potential operational related biological impacts will include the following:

- Minimizing the total area of disturbance,
- Design, construction, and operation of facilities to minimize biological impacts including barriers to wildlife movements,
- Design and installation of electrical equipment to minimize electrocution hazards,
- Establishment of stream buffer zones,
- Control and monitoring of surface discharges and water quality,
- Exclusion of wildlife from potentially hazardous areas, and
- Reclamation of disturbed areas when they are no longer needed.

The raptor survey by the UDWR in 1997 lists the three nests within Section 16, T13S, R12E, as being two inactive hawk nests and an old dilapidated golden eagle nest. The dilapidated nest and an inactive hawk nest are located over a area planned for mining during 2001 to 2005 (comparison of Plates 3-2 and 5-7). The second inactive hawk nest is within the area of potential subsidence but not over mining. Since the condition of these nests may change by the time mining reaches their location a plan for their protection or taking will not be determined at this time.

The nests in Section 16 will be monitored in the annual raptor survey. Nine months or the summer prior to the period of potential subsidence a determination by SCM, UDWR (Fish and Wildlife) and UDOGM will be made as to the method(s) to be used for the protection of the nest(s).

Section 22, T13S, R12E contains a raven nest and an active golden eagle nest. Bill Bates and Ben Morris concurred that "the raven nest in Section 22 was not of particular concern, but that the golden eagle nest should be monitored." See Sections 322.200, 333.300 and 358.100 for the raptor monitoring commitments. The golden eagle nest is located over a area planned for mining during 2000 to 2001 (comparison of Plates 3-2 and 5-7). This nest will most likely continue to be

active. The plan to protect the nesting birds will include a survey of the nest location the year prior to second mining to determine activity. In addition, the potential for laying, incubation or existence of young will be evaluated. The spring prior to the period of potential subsidence a determination by SCM, UDWR (Fish and Wildlife) and UDOGM will be made as to the method(s) to be used for the protection of the nest(s) (see Section 333.300).

Only one of the old dilapidated golden eagle nests surveyed in Section 23 during 1997 was surveyed during the 1998 raptor survey. The UDWR in Price and Salt Lake and the Fish and Wildlife Service both in Salt Lake and Denver have been contacted to determine the need for a "take permit" for this nest.

According to a comparison of the raptor surveys performed in 1995 and 1997, the nest inhabitants, conditions and existence may change. Therefore each nest should be evaluated separately and not as a collective. Methods of protection will be determined on a case by case basis using the "best technology available".

The raptor nests located in the survey taken in 1998 are plotted on Plate 3-2.

### **333.100 Minimized Disturbance to Endangered or Threatened Species**

SCM will apply all methods necessary to minimize disturbances or any adverse effects to endangered and threatened species listed on the tables in Appendix 3-3.

### **333.200 Species and Habitats**

All species and habitats within the permit area will be protected to the best of SCM ability. Wildlife habitat protection will be considered in the construction of facilities. For additional information, see Section 333.300.

### **333.300 Protective Measures**

Upon notification or suspicion of raptor nests within the permit boundary cliff escarpment subsidence zone the following inventory will be taken to determine the potential actions to be taken by SCM.

- Verify the existence of a nest or nests,
- Verify occupation by birds/raptors, eggs or young,
- Determine the condition of nest or nests,
- Location of nest in relationship to recoverable resource (creation of table with nest location number and planned year for undermining).

The information collected in the inventory will be discussed with various agency personnel (i.e., UDOGM, USFWS, DWR, etc.). SCM and the various agencies will determine:

- a method of avoidance when possible,
- determine seasons/months for nests to be covered/uncovered,
- explore alternative methods of protection or removal, and
- develop a mitigation plan when needed.

The method(s) to be used will be determined prior to the period of potential subsidence.

SCM does not currently know the exact locations or thicknesses of recoverable resource, therefore to determine the potential loss of revenues is premature in relation to the avoidance of a raptor nest or nests. Each nest(s) and its corresponding occupant(s) and circumstances will be evaluated by a qualified person nine months or the summer prior to the period of potential subsidence. A determination by SCM, UDWR (Fish and Wildlife) and UDOGM will be made as to the method(s) to be used for the protection/avoidance/removal of the nest(s) (refer above to inventory listing in this section).

SCM commits to include wildlife awareness and protection training in it's annual training curriculum for employees and request the haulage contractors to provide the same training for it's employees.

Wildlife accustom to their current sources of food may be endangered with a change or enhancement of plant species. The improvement or addition of water developments can act to concentrate wildlife in a specific area, thus causing compaction to soils and over grazing of vegetation in an area. Areas which may be fenced to exclude livestock from an area, may also exclude wildlife, thus causing increased competition for food and territory in another area. Since SCM is unaware of the possible advantages or disadvantages to change in an area of habitat, we commit to use the best technology currently available to handle specific concerns, and which will benefit the greatest range of wildlife. Should the enhancement of habitat outside the disturbed area become necessary to attract wildlife away from the mining facilities, efforts will be coordinated with the UDWR.

Revegetation of disturbed areas, as part of the reclamation effort, will include a mixture of grasses, forbs, shrubs and trees which are beneficial to wildlife.

As part of the overall surface water monitoring program, SCM will monitor surface water flow to determine it's relationship to area subsidence. See Chapter 7 of this M&RP for a discussion of the water monitoring program.

Areas of potential mining will be surveyed for raptor nests prior to the beginning of mining and two seasons after mining has ceased. Pertinent data gathered in these surveys will be included in this M&RP and evaluated by qualified personnel to determine the method(s) to be used to avoid, protect, or take the raptor's nest(s).

Before a pesticide is used, the type and concentration will be approved in conjunction with UDWR or the Division.

During the construction of the Dugout Mine, wildlife in the area will most likely be displaced due to the noise and added human activity. Construction, mining, supplier personnel and their corresponding equipment will be required to stay within the disturbed area boundary during construction activities. Loading, unloading, and staging of materials and equipment designated for the construction of the Dugout Canyon Mine facilities will be done within the disturbed area boundary. Fluids used to maintain construction equipment will be stored in a safe method, to prevent contamination.

### **340 RECLAMATION PLAN**

The reclamation plan will include the following: seed mix, rate of seedlings per acre, stocking rates for shrub and tree plantings, planting techniques, fertilization methods, and amount and frequency of application. The fish and wildlife plan for the permit area is outlined in Section 342.

### **341 Revegetation**

The reclamation plan for final revegetation is included in this section for lands to be disturbed by coal mining and reclamation operations.

The short-term goal of this revegetation plan is the immediate stabilization of the disturbed sites through erosion control. This objective will be achieved through controlled grading practices, proper seedbed preparation to encourage rapid plant establishment, inclusion of rapidly establishing species in the seed mixture to be planted, and mulch application.

The long-term goals are to establish useful, productive range and wildlife habitat. These goals will be attained through the selection and placement of desirable and productive plant species, and a commitment to monitor and maintain revegetated areas throughout the bond liability period.

#### **341.100 Schedule and Timetable**

The reclamation timetable is outlined in Figure 5-3. The reclamation monitoring schedule is outlined in Table 3-3.

The planting of seeds and seedlings will be undertaken at the most feasible time following disturbance activities. Planting will begin after the plant growth medium has been replaced. Final reclamation grasses, forbs, shrubs, and seedlings will be planned for planting in late August through early October. Should the planting window close prior to completion of seeding, a sterile, quick growing ground cover will be planted to control erosion during the winter months. The final reclamation seed mixture will be planted the following spring and fall.

#### **341.200 Descriptions**

**Species and Amounts of Seed.** All revegetated areas within the disturbed area boundary will be planted with the seed mixes listed below:

**Interim Seed Mix (Drilled Quantities)**

<u>SPECIES</u>	<u># pls/acre</u>
Indian ricegrass	2
Western wheatgrass	3
Slender wheatgrass	3
Thickspike wheatgrass	4
Kentucky Bluegrass	1
TOTAL	<hr/> 13

**Final Reclamation Seed Mix #1 (Drilled Quantities)**

<u>SPECIES</u>	<u># pls/acre</u>
<b>Grasses, Forbs, and Shrubs</b>	
Bluebunch Wheatgrass	3.0
Western wheatgrass	4.0
Slender wheatgrass	1.0
Thickspike wheatgrass	1.0
Idaho fescue	1.0
Indian ricegrass	2.0
Blueleaf aster	0.5
Blue flax	1.0
Palmer Penstemon	0.5
Northern sweetvetch	1.0
Mountain big sagebrush	0.5
Louisiana sagebrush	1.0
Fourwing saltbrush	1.0
Bitterbrush	1.0
Curl-leaf mountain mahogany	1.0
TOTAL	<hr/> 19.5

**Transplants and/or seedlings per acre**

Snowberry	75
Utah serviceberry	75
Pinyon pine	200
Utah juniper	200
TOTAL	<hr/> 550



The rate of seeding per acre when broadcast will be doubled of the rate of seeding when drilled.

**Final Reclamation Seed Mix #2 (Drilled Quantities)**

<u>SPECIES</u>	<u># pls/acre</u>
<b>Grasses, Forbs, and Shrubs</b>	
Mountain brome	3.0
Western wheatgrass	5.0
Indian ricegrass	3.0
Slender wheatgrass	3.0
Thickspike wheatgrass	3.0
Kentucky bluegrass	1.5
Columbine	1.0
Blue flax	1.0
Palmer penstemon	1.0
Northern sweetvetch	.5
Louisiana sagebrush	1.0
TOTAL	<u>23.0</u>

**Transplants and/or seedlings per acre**

Carex spp.	500
Horsetail	<u>500</u>
TOTAL	1000

**Streambanks/channel bottom will receive the following trees<sup>(a)</sup> and shrubs**

	<u>Seedlings/acre</u>
Narrowleaf cottonwood	250
Rocky Mountain maple	250
Willow <sup>(b)</sup>	4000
Woods rose	1000
Snowberry	250
Utah serviceberry	250
Blue elderberry	250
Chokecherry	250
Golden current	<u>250</u>
TOTAL	6750

\* UDWR requested no conifers be included in the riparian seed mix.

- (b) Cuttings/transplants and/or seedlings will be used. The quantity of willows to actually be planted may vary due to the availability of suitable area within the channel for planting. CFC requests permission to consult with a botanist and UDOGM at the time of reclamation to determine the final number of willows to be planted and to prepare a plan for potential planting and replanting should seedling be lost due to pestilence. It may be beneficial to plant the willows over a period of years as the stream has time to deposit sediment, thus providing natural areas for planting. If deemed appropriate by the botanist and UDOGM at the time of reclamation the 4,000 willows per acre commitment will be met.

The rate of seeding per acre when broadcast will be doubled of the rate of seeding when drilled.

**Final Reclamation Seed Mix #3 (Broadcast Quantities)**

<u>SPECIES</u>	<u># pls/acre</u>	<u># pls/sq. ft.**</u>
<b>Grasses, Forbs, and Shrubs</b>		
Salina Wildrye (379,500 seeds/lb)*	2.5	22
Indian Rice Grass (162,000 seeds/lb)*	3.5	13
Galleta Grass (150,000 seeds/lb)*	3.5	12
Muttongrass ( 2,000,000 seeds/lb)*	0.5	23
Mtn. Snowberry (54,000 seeds/lb)*	4.0	5
Wyoming Big Sage (2,500,000 seeds/lb)*	0.5	29
Rocky Mountain Penstemon (260,000 seeds/lb)*	0.5	14
Yarrow (2,770,000 seed/lb)*	0.1	6
Louisiana Sagewort (3,000,000 seed/lb)*	0.1	6
<b>TOTAL</b>	<b>15.2</b>	<b>130</b>

\* Native Plants

\*\* Rounded nearest whole seed

Seed Mix No.1 will be used on the majority of the Dugout Canyon disturbed area (Pinyon-Utah juniper - upland very steep shallow loam, Plate 3-1A) . Seed Mix No. 2 will be used to reseed the riparian area of Dugout Creek (Plate 3-1A). Hydrophytic vegetation will be planted during the low flow of the reclamation channel. Seed Mix No. 3 will be used to reclaim the Pace Canyon Fan

Portal facilities. Although, native forbs were found in the reference area for the proposed Pace Canyon disturbance, the species were not readily available for purchase, therefore they have not been included in the seed mix.

**Method Used for Planting and Seeding.** The surface will be ripped to between 6 and 24 inches to reduce surface compaction. Ripping will be completed on approximately 4-foot centers. Final ripping depths will be determined by the soil materials being ripped. On slopes too steep for ripping the soil materials will be at a minimum pocked/gouged.

Following ripping, topsoil (or substitute topsoil) will be applied to the ripped surface and left in a roughened state. Topsoil samples will be collected and sent to the laboratory for analysis to determine fertilizer requirements. The area will be broadcast fertilized if recommended using a hand held "cyclone-type" seeder in smaller areas, and applied with hydroseeding equipment in larger areas. Where possible, a ripper equipped tractor or other appropriate equipment will be used to incorporate the fertilizer into the soil. On slopes too steep to accommodate the use of a tractor or other appropriate equipment the fertilizer will be incorporated with the track hoe bucket teeth or other Division approved technology. All nutrients will be applied in a single application.

Seeding for grasses, shrubs, and forbs will be accomplished by drilling and/or broadcasting. All equipment used will be equipped with metering devices. Except as noted below all areas will be fertilized and seeded using the same methodology.

Broadcast seeding will be used on slopes too steep to accommodate a tractor.

Seedlings/transplants will be planted by first clearing a circle of 12 to 24 inches in diameter from which mulch materials and grasses will be cleared. The hole will be dug 4 to 6 inches deeper than the seedling roots to accommodate positioning of the seedling. Fertilizer will either be mixed with the loose soil from the hole or a fertilizer tablet will be planted with each seedling. After seedling placement, the hole will be backfilled with soil and fertilizer then lightly tamped. A gently sloped basin will be formed around the seedling to catch water. The basin will be mulched to aid in moisture retention.

Technical notes (No. 23, September 1993) and project information data published by the NRCS were consulted to provide detail for planting the riparian area, willows, and cottonwoods.

"Rhisomatous willows usually should be planted on inside curves of a stream channel, they are rarely found on sharp outside curves in nature. Shrubby species are normally planted on outside curves of a stream channel as a continuous barrier. Plant the entire reach with the same species. Taller shrubby species may also be planted mid-bank to upper bank and on the floodplains for diversity and additional stabilization or as a buffer zone. Plant tree species up the bank from the shrubby species or on top of the bank."

"Plug, containerized, bare-root, potted and paper-sleeve planting are best used on mid-bank to upper bank or floodplains where long periods of inundation or water erosion is minimized, but where adequate moisture is available through natural precipitation. Where plant have a low risk of physically being pulled or eroded out due to shallow rooting systems during establishment and where there is no competing vegetation."

Transplants (cuttings, whips, plugs, bare-root, potted) "less than 3/8" inch diameter are not recommended because energy reserves in the stems are limited. Pole cutting (3/4" large diameter unrooted stems) are recommended for most planting from water line to mid-bank. Pole cuttings of willows and cottonwoods are also recommended on upper-banks and flood plains where the water table is relatively deep."

"Cutting length is largely determined by the depth to the mid-summer water table and erosive force of the stream at the planting site. Planting can occur at the water line, up the bank, and on top of bank in relatively dry soil, as long as cuttings are long enough to reach into the mid-summer water table. Make sure, several inches of cutting are in the mid-summer water table, 3-4 buds are above ground, and no less than 1/2 the total length is in the ground"

"However the larger the cutting diameter, the longer the cutting should be, and the deeper the hole should be. Larger diameter and longer cuttings will be needed for more severely eroding sites and where the water table is deeper."

"Plant the cuttings about 1 - 3 feet apart for shrubby types and 6-12 feet apart for tree types. In areas where you expect erosion, plant shrubby types 1 - 1.5 feet apart to better protect the banks. Exact spacing between tree-types further up the bank and shrubby types below should be based on crown characteristics and height. General ideas on spacing can be found in the Idaho Tree Planting Handbook."

"A tractor-mounted post hole digger, a one or two man post hole digger, a soil auger, a large bar, a planting shovel, or just punching the cutting into moist soil have all been used successfully in the past to plant willows."

The reclaimed riparian area will be planted with cuttings/transplants/seedlings using the following guidelines as suggested by NRCS literature.

- The Idaho Tree Planting Handbook or similar instructional material will be consulted during reclamation to determine the spacing for the planting of shrubs and tree cuttings/transplants/seedlings. Trees and shrubs will be interspersed with areas seeded with grasses and forbs.
- Species will be planted with a tractor-mounted post hole digger, a one or two man post hole digger, a soil auger, a large bar, a planting shovel, or punching into soil.
- Tree species will be planted up the bank from the shrub species or on top of the channel slope.
- Shrubs species will be planted between the top of the riprap and the top of the channel slope.
- Willows will be planted in the riprap on the channel side slopes and the edges of the channel bottom.
- Stems for planting will be 3/8" diameter or larger.
- Length of cuttings will be determined by where they are planted (i.e. water line, top of slope or etc. ), but will be long/large enough to reach into the anticipated water table, with 3-4 buds above ground.

The cuttings/transplants/seedlings will be interspersed with areas of grass and forbs in a mosaic pattern as in the current riparian area. The shrub density data from the 1997 survey designates the trees within the riparian area to be: 27.2 maples, 96.5 junipers, 107.4 cottonwoods and 28.8 firs per acre. SCM proposes to plant 250 maples and 250 cottonwoods per acre. Junipers and firs have not been included in Seed Mix #2 at the request of the UDWR. The 500 maples and cottonwoods should be sufficient to achieve bond release if the mortality rate is between 10 and 25% (Dan Ogle, NRCS Plant Material Specialist). NRCS guidelines are considered

recommendations and SCM understands they are ultimately responsible for meeting revegetation success standards.

If cottonwoods are planted as cuttings or poles they will be long enough to reach the water table and large enough in size (1 - 3" diameter) to have sufficient energy reserves for survival. An irrigation program will be considered if the cottonwoods are planted as transplants. The particular character of cottonwood to be planted will be determined at the time of reclamation.

Transplants with root balls will be planted as described previously and with the recommendations of published literature available at the time of reclamation. Channel slopes as currently designed, vary between 3 and 4 feet.

Figure 3-1 is provided to approximate the location of each planting zone described above, not as a typical design of the stream channel slopes, their height, width or length.

Seeding methods are discussed previously in this section.

The Division has requested information concerning the average high and low water mark for the reclaimed Dugout Creek channel as a means of evaluating the potential survivability of phreatophytes which will be planted during reclamation. However, from a hydrologic standpoint the concept of average high and low water marks is vague for a channel since the levels are both time- and probability-dependent. For example, it is common to speak of the water-surface profile, which might be expected during the 10-year, 7-day low-flow periods or the 25-year, 6-hour precipitation event, but not the "average" low flow or the "average" high flow. SCM will provide such data if it can be meaningfully defined and will assist with revegetation success. In any event, cuttings/transplants will be planted to facilitate successful re-establishment of the riparian vegetation, with the depth of planting being determined by a consensus of the published literature which is available at the time of reclamation and the drilling of periodic holes along the reclamation channel to determine the depth to the water table.

**Mulching Techniques.** Following seeding, the disturbed areas will be mulched with a Division-approved mulching material. For bonding calculations, wood fiber mulch will be the assumed mulching application. Application will be initiated at the tip of the slope and working downhill. Mulch will be applied at the rate of 2000 pounds per acre and anchored with a tackifier.



In consultation with the Division, should a determination be made that a slope(s) is too steep to retain a mulch application, the slope(s) will be pocked/gouged and will receive no mulch application. Mulching and revegetation will not be attempted on sheer rock outcrops.

Mulch used for the mitigation project in 1998 of the upper portion of Dugout Canyon is discussed in Section 322.200.

**Irrigation, Pest and Disease Control.** No irrigation is planned and pesticides will not be used unless previously approved by the Division.

**Measures Proposed for Revegetation Success.** SCM will plant species of the same seasonal variety as those existing prior to the proposed disturbance.

To effect bond release at the end of the 10-year responsibility period, SCM will measure required vegetation variables (ground cover, herbaceous productivity, and woody plant density) as outlined on Table 3-3. Measurement will occur during the same time each year using appropriate techniques.

Productivity sampling will involve use of a sample random technique whereby 1 to 2 m<sup>2</sup> plots (rectangular in shape) will be clipped by life form for all current annual production. Sample parameters determined for these variables will be used to test the success of revegetation during each of these years and will prove establishment of adequate cover, suitable productivity, reasonable density, and adequate species composition.

The estimated parameters for the variables of ground cover, herbaceous productivity, and woody plant density will be obtained in a statistically-adequate manner. Refer to Section 356.200 for a discussion on revegetation success standards.

The revegetative success standard for cover in the Pinyon-Juniper area is 66% and 85% for the riparian area in Dugout Canyon.

#### Pace Canyon

**Method Used for Planting and Seeding.** The surface will be ripped to approximately 18 inches. On slopes too steep for ripping the soil materials will be at a minimum pocked/gouged.

Following ripping, a minimum of 12" of topsoil/growth medium will be applied to the ripped surface and left in a roughened state. One ton of certified noxious weed free hay/straw per acre will be crimped into the topsoil. The surface will then be pocked and gouged, the pocking will be done with the bucket of a backhoe, the holes(pocks) will be approximately the width and depth of the bucket. The area soils will then be sprayed with Seed Mix #3 mixed with a small amount of wood fiber mulch by hydroseeding equipment. Following the seeding the area soils will be sprayed with wood fiber mulch (one ton per acre) mix with tackifier (60 lbs. per acre). Mulching and revegetation will not be attempted on sheer rock outcrops.

**Success of revegetation** and stabilization of the fan portal facilities area will be evaluated during each growing season as outlined on Table 3-3, when cover and compositions studies are most feasible. Sample parameters determined from reference area data will be used to test the success of revegetation and will prove establishment of adequate cover, suitable productivity, reasonable density, and adequate species composition. Student's t-tests were employed to compare the total living cover and total woody species density of the proposed disturbed area and it's reference area (Mt. Nebo, Appendix 3-4).

**TABLE 3-3**  
**RECLAMATION MONITORING SCHEDULE**

	YEAR									
	1	2	3	4	5	6	7	8	9	10
QUALITATIVE SAMPLING	X	X	X	X	X	X	X	X	X	X
QUANTITATIVE SAMPLING										
Cover		X	X		X				X	X
Frequency		X	X		X				X	X
Woody Plant Density		X	X		X				X	X
Transplant Survival	X	X	X		X					
Productivity									X	X



Figure 3-1

### **341.300 Greenhouse Studies, Field Trials or Other Equivalent Studies**

SCM will comply, should the Division provide evidence to support additional testing to demonstrate that reclamation as required by the State Program can be accomplished according to information provided in this M&RP.

## **342 Fish and Wildlife**

Revegetation to sustain and improve wildlife habitat will be SCM's primary concern following the termination of mining operations. High value habitats will be restored and enhanced beyond their pre-mining conditions since the area is being redisturbed after previous mining. The plan is consistent with Sections 330 and 358.

### **342.100 Enhancement Measures**

Enhancements of the stream channel are discussed in Sections 322.200 and 762.100. No additional enhancements are planned.

### **342.200 Plants Used for Wildlife Habitat**

The plant species in the reclamation seed mix are consistent with those presently grown in the permit area, with additional species added for diversity as requested by the Division. Section 341.200 contains the proposed reclamation seed, tree, and shrub mix.

**Nutritional Value.** The nutritional value will be consistent with that of vegetation in the surrounding areas.

**Cover.** The goal of SCM is to establish plant species which will provide sufficient cover for the fish and wildlife of the area. See Section 341 for additional discussion.

**Ability to Support and Enhance.** The plant species included in the proposed reclamation mixes have the ability to support and enhance the fish or wildlife habitat after the release of the performance bonds. Shrubs and trees will be planted to enhance survival and provide wildlife habitat. The trees and shrubs in the final reclamation seed mix will be used to ensure

establishment of an enhanced vegetation community within the disturbed site. The disturbed riparian community will be restored and enhanced during reclamation efforts.

#### **342.300 Cropland**

Cropland is not a postmining land use.

#### **342.400 Residential, Public Service and Industrial Land Use**

No residential, industrial or public service use is planned at the present time for the permit area following the termination of mining.

### **350 PERFORMANCE STANDARDS**

#### **351 General Requirements**

SCM commits to conduct all operations in accordance with the plans submitted in Sections R645-301-330 through R645-301-340 of the permit application.

#### **352 Contemporaneous Reclamation**

Reclamation activities prior to final reclamation will, to the extent feasible, be performed contemporaneously with mining operations. Areas to receive interim reclamation will be seeded with the interim seed mix.

The interim seed mix (Section 341.200) will be used to establish a shallow rooting cover of grasses for those areas disturbed during the development of the Gilson Well pad and relocation of Dugout Creek (west fork). The riparian area associated with the disturbance will receive reclamation as dictated in the stream channel alteration permit and Section 341 of the M&RP. The Pace Canyon Fan Portal topsoil stockpiles will be contemporaneously reclaimed using the only the grass seeds specified in Seed Mix No. 3.

Revegetation will not be done in areas required to be kept barren of vegetation such as areas around mine ventilation openings.

### **353 Revegetation: General Requirements**

A vegetative cover will be established on all reclaimed areas to allow for the designated postmining land use of livestock grazing and wildlife habitat. Other than a road which will be retained through the facilities area following reclamation to allow access to private land within the permit area, all roads within the disturbed area boundary will be reclaimed. The vegetative cover will be in accordance with the approved permit and reclamation plan. All species of vegetation to be used in reclamation activities, whether planted by seed or seedling, will be approved by the Division (i.e. interim, mitigation, #1 and #2 seed mixes). Seed Mix No. 3 will be used at the Pace Canyon Fan Portal facilities during reclamation, the entire reclaimed surface will receive this seed mix except for the realigned road segment. The road is used as access by the BLM and private land owners.

#### **353.100 Vegetative Cover**

The seed mix proposed for revegetation is intended to provide vegetative cover that will be diverse, effective, and permanent. The seed mixture was selected with respect to the climate, potential seedbed quality, erosion control, drought tolerance, and the mixture's ability for quick establishment and spreading.

**Native Species.** The reclamation vegetative mixture (seeds, shrubs, and trees) will be comprise of species indigenous to the area, capable of achieving the postmining land use as approved by the Division. Diversity of species should allow ultimate utilization of plants by wildlife and domestic livestock.

The revegetative species will be purchased from suppliers who will certify their percentages of purity, germination, hard seed, and percentages of maximum weed seed content.

**Extent of Cover.** The vegetative cover will be at least equal in extent to the cover as determined by the range site sampling as discussed in Section 341.200. The Pace Canyon Fan Portal area will be compared to the reference area shown on Plate 3-1E.

**Stabilizing.** The vegetative cover mixture is capable of stabilizing the soil surface from erosion.

### **353.200 Reestablished Plant Species**

**Compatible.** The reestablished plant species have been selected to insure their compatibility with the approved postmining use.

**Seasonal Characteristics.** The revegetation plant species will have the same growing season as the original vegetation, or in this instance, as the adjacent areas.

**Self-generation.** The reestablished plants are species capable of self-generation and plant succession.

**Compatibility.** The seed mix suggested for revegetation contains plants native to the area and compatible with the plant and animal species of the permit area.

**Federal and Utah Laws or Regulations.** The seed mixture purchased to revegetate the mine area will contain no poisonous or noxious plant. No species will be introduced in the area without being approved by the Division.

### **353.300 Vegetative Exception**

SCM does not require vegetative exception at this time.

### **353.400 Cropland**

The permit area contains no land designated as cropland.

### **354 Revegetation: Timing**

SCM will follow the recommended guidelines for revegetation as discussed in Section 341.100.

### **355 Revegetation: Mulching and Other Soil Stabilizing Practices**

Mulch and/or other soil stabilizing practices (pocking, gouging, roughening, etc.) will be used on all areas that have been regraded and covered by topsoil or topsoil substitutes (see Section

341.200). SCM will exercise care to guard against erosion during and after application of topsoil and will employ the necessary measures to ensure the stability of topsoil on graded slopes.

### **356 Revegetation: Standards for Success**

The standards for revegetation success are discussed in this section and in Section 341.200.

Range Site Success Standards for Reclamation (Dugout Canyon Facilities):

	<u>Pinyon/Utah Juniper</u>	<u>Riparian</u>
Ground Cover	66%	85%
NRCS Production	800 lbs/acre	1500 lbs/acre
Shrub-Tree Density/Stocking	2200 stems/acre	2 2 0 0 stems/acre
Diversity	2 Tree/shrub species 3 Grass species 2 Forb species	2 Tree/shrub species 3 Grass species 2 Forb species

For a species to be counted as one of the species that constitute vegetation diversity it must exist in the actual plant community at a minimum of 5%.

The sampling methods to be used during reclamation will be specific to the requirements at the time of reclamation. Nonetheless, according to the currently approved UDOGM guidelines, these sampling methods would be used: sample adequacy, cover (line interception), density (belt transects or plots) and productivity (clipping and/or NRCS estimation). The Jaccard's Community Coefficient will be used to calculate acceptable plant similarity and diversity.

During the Fall of 1997, productivity for the disturbed area was determined by George Cook, a range conservationist for the NRCS. Mr. Cook determined the Pinyon/Utah Juniper area to be in good condition with 800 lbs/acre air dry weight production. The riparian area was determined to

be in fair condition with 1500 lbs/acre of air day weight production. Should the NRCS determination of production be insufficient to satisfy the requirement for standards of success, SCM commits to sample productivity at a corresponding range site.

Range sites for reclamation comparison purposes were chosen by a qualified person contracted by SCM and in cooperation with the Division. Range sites in Fish Creek Canyon representing both the pinyon/juniper and riparian vegetation types were sampled for cover in September, 1998 (Appendix 3-1). These specific range sites correspond with the cover quantities sampled for the pinyon/juniper and riparian areas within the Dugout Mine disturbed area boundary. The cover data for each range site was submitted to the Division for evaluation and approved for reclamation comparison (Appendix 3-1). The designated range sites will be used as a reference area until final revegetative bond release has been issued. The location of the area to be used for range site comparison is designated on Plates 3-1 and 3-1D .

The sites for sampling were chosen (September, 1998) in cooperation with Paul Baker (UDOGM).

#### **356.100 Success of Revegetation**

The success standards for approval will be judged on the effectiveness of the vegetation for postmining land use and the standards outlined in Section 353.

Within the Utah Division of Oil, Gas and Mining Vegetation Guidelines (Revised February, 1992) three methods for sampling vegetation are discussed; reference areas, range sites and the baseline data method. Each method describes the requirements for its subsequent use, however the sampling of diversity was not discussed within any of these methods.

The baseline data method could not be used at the Dugout Canyon Mine site due to previous disturbance by mining. Likewise the reference areas method could not be used since reference areas were not approved by the Division. Therefore the range site method has been adopted for use at the Dugout Canyon Mine.



The range site number used for comparison of revegetation success is 033XY342UT, upland very steep shallow loam (Pinyon-Utah Juniper). The area sampled by Patricia Johnston in 1997 met the requirements of Method #2 - Range Sites of the UDOGM Vegetation Guidelines, February 1992. Legible copies of data sheets from the sampling are included in Appendix 3-1.

**Sampling Techniques (Dugout Canyon)** . SCM will comply with the standards for success, statistically valid sampling techniques for measuring success, and the approved methods outlined in the Division's "Vegetation Information Guidelines" for sampling.

**Sampling Techniques (Pace Canyon)**- Permittee will comply with the standards for success, statistically valid sampling techniques for measuring success, and the approved methods outline in the Division's "Vegetation Information Guidelines, Appendix A" for sampling.

The sampling methods to be used during reclamation will be the "best technology currently available" at the time of reclamation. Nonetheless, according to the currently approved UDOGM guidelines, these sampling methods would be used: sample adequacy, cover (line interception), density (belt transects or plots), productivity (clipping ) and the "best technology currently available" will be used to calculate acceptable plant similarity and diversity.

**Standards for Success.** The standards for success will include criteria representative of unmined lands in the area of the permit and as discussed in Section 356.200. In **Pace Canyon**, the standards for success will include criteria representative of undisturbed lands in the area of the disturbance (reference area), as means to evaluate ground cover, production and stocking of the reclaimed site. The sampling techniques for success in Pace Canyon will use a 90 percent statistical confidence interval as required by R645-301-356.120.

### **356.200 Standards for Success**

Standards of success will be applied in accordance with the approved postmining land use as described in this section.



**Grazing Land or Pasture Land.** The ground cover and production of living plants on the revegetated area will be at least equal to the specified success standards.

**Cropland.** There is no area designated as cropland within the permit area.

**Fish and Wildlife Habitat.** The success of revegetation for fish and wildlife habitat will be determined on the basis of tree and shrub stocking and vegetative ground cover. Minimum stocking and planting arrangements will be those approved by the Division on the basis of local and regional conditions. Cover success will not be less than that required to achieve the approved postmining land use.

**Industrial, Commercial or Residential.** The postmining land use for the permit area is not designated for industrial, commercial, or residential use.

**Previously Disturbed Areas.** Dugout Canyon contains the remains of earlier mining operations. The site was not reclaimed or revegetated following the earlier operations. Pace Canyon contains the remains of earlier mining, disturbance by logging activities, and road access disturbance. The area was neither reclaimed or revegetated following the aforementioned disturbance.

Due to the previous disturbance of the sites, SCM will restore the vegetative ground cover to that of the surrounding area as discussed in Section 341.200 and the ground cover will be adequate to control erosion.

### **356.300 Siltation Structure Maintenance**

Siltation structures will be maintained until removal is authorized by the Division and the disturbed areas have been stabilized and revegetated. Siltation structures will be removed

no sooner than two years after the last augmented seeding. For additional details on siltation structures, see Section 542 of this M&RP.

### **356.400 Removal of Siltation Structures**

The land on which siltation structures are located will be revegetated in accordance with the reclamation plan discussed in Sections 353 through 357 of this M&RP.

### **357 Revegetation: Extended Responsibility Period**

SCM will be responsible for the success of revegetation for a period of 10 years following reclamation seeding of the reclaimed mine area or upon Division bond release.

#### **357.100 Extended Period Begins**

The period of extended responsibility will begin the year after the disturbed area has been reseeded.

#### **357.200 Vegetative Parameters**

Vegetation parameters will equal or exceed the approved success standard during the last 2 years of the responsibility period. The success standards are outlined in Section 356.

#### **357.300 Husbandry Practices**

SCM will comply with Division-approved husbandry practices which will be normal conservation practices within the region of the mine. These practices may include disease, pest, and vermin control; and any pruning, reseeding, and transplanting required.

### **358 Protection of Fish, Wildlife and Related Environmental Values**

SCM will minimize disturbances and adverse impacts on fish, wildlife, and their related environments as outlined in Section 333.

The intermittent flow of streams within the lease area does not support a population of game fish; therefore, there are no fisheries within the disturbed area to protect. In addition, the streams in Pace and Rock Canyons have intermittent flow and do not support a population of game fish. See Chapter 7 of this M&RP for methods to protect water sources in the area.

Proposed surface disturbance associated with mining activities will be reviewed by the DWR and UDOGM in reference to wildlife exclusionary periods. A letter concerning mitigation for drilling disturbance in 2004 - 2006 is located in Appendix 3-3.

### **358.100 Existence of Endangered or Threatened Species**

Coal mining will not be conducted where its operation might jeopardize the existence of any endangered or threatened species. The mining of coal will not result in the planned destruction or adverse modification of these species critical habitat, unless approved by appropriate agency(ies).

Any state or federally listed endangered or threatened specie will be reported to the Division upon its discovery. A ground nest survey for raptors and bird species of special interest was performed prior to site disturbance by a qualified person. A letter report of the ground nest survey is included in Appendix 3-3. Mining operations will proceed in accordance with Division stipulations. These stipulations also apply to reclamation operations at the Dugout Canyon Mine.

Lists of threatened, endangered, and sensitive species are included in Appendix 3-3. In addition, Appendix 3-3 contains 2003 and 2004 survey data for Mexican Spotted Owls and a letter from the DWR concerning installation of nesting boxes to satisfy mitigation requirements.

### **358.200 Bald and Golden Eagles**

Coal mining and reclamation operations will be conducted in a manner protective of bald and golden eagles. SCM will promptly report any golden or bald eagle nests found within the permit boundaries and will proceed with operations in accordance with the Division's stipulations for protection of those nests. Refer to Section 333 for a discussion of methods of nest protection during potential subsidence.

### **358.300 Taking of Endangered or Threatened Species**

SCM understands that there is no permission implied by these regulations for taking of endangered or threatened species, their nests, or eggs.

### **358.400 Replacement of Wetland and Riparian Vegetation**

The Division will be consulted on the best technology to replace and enhance the riparian vegetation to be disturbed.

### **358.500 Manmade Wildlife Protection Measure**

**Electric Power Lines.** All power lines within the Dugout Canyon Mine disturbed area will comply or be modified to be raptor safe and comply with the guidelines of REA Bulletin 61-10, "Power Line Contacts by Eagles and Other Large Birds". Refer to Plates 4-1 and 5-2 for power pole locations.

**Potential Barriers.** When possible, structures built by SCM in Dugout Canyon will be designed and built to provide corridors of passage to large mammals.

**Pond Protection.** Fences or other appropriate methods will be used to exclude wildlife from ponds containing hazardous or toxic materials. However, SCM does not intend to store hazardous or toxic materials in ponds.

**REFERENCES:**

- Blumer, Ralph J., 1979. Environmental Analysis, pp 25-26.
- Hoag, Chris J. , How to Plant Willows and Cottonwood Dormant Pole Cuttings for Riparian Rehabilitation. Riparian/Wetland Project Information Series No. 4
- Kuchler, A.W. 1975. Potential Natural Vegetation of the Conterminous United States. Amer. Geo. Soc., Spec. Publ. No. 36. Map.
- USDA, 1988. Soil Survey of Carbon Area, Utah. Soil Conservation Service.
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- Utah Division of Wildlife Resources, 1990. Fauna of Southeastern Utah and Life Requisites Regarding Their Ecosystems. Pub. No. 90-11.
- Utah Division of Wildlife Resources, 1979. Study to Determine Effects of Coal Development on Wildlife in Southeastern Utah. Prepared for Eureka Energy Company.
- Utah Division of Wildlife Resources, 1979a. Fish and Wildlife Resources Information - Sage Point-Dugout Canyon Project. Prepared for Eureka Energy Company.

**CHAPTER 4**  
**LAND USE AND AIR QUALITY**

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## **CHAPTER 4**

### **LAND USE AND AIR QUALITY**

#### **410 LAND USE**

This section of the permit application includes descriptions of the premining and proposed postmining land use(s). Additional information can be found in the following amendments: Methane Degassification Amendment (August 2003), Refuse Pile Amendment (February 2003), and the Leachfield Addendum A-1 (March 2001). The remainder of the State Lease ML-48435-OBA (SITLA Lease) was incorporated into the Dugout Canyon Mine permit area in 2004. ~~In 2007, 40 acres was added to Federal Coal Lease U-07064-027821 to accommodate a revised mine plan. Refer to Plate 1-2 and 4-1 for the location of the acreage incorporated into the permit boundary. Surface disturbance will be permitted as needed to facilitate mining activities.~~

In 2007 acreage (487.57 acres) was added to existing Federal Coal Lease U-07064-027821, two hundred and forty-seven acres of this added acreage is already included as part of the Dugout permitted area. Acreage was previously added to the permit area in excess of the Federal leased acreage to act as a subsidence buffer zone (207 acres) and to accommodate a revised mine plan (40 acres). In addition, State Lease ML-50582-OBA (320 acres, more or less) was issued to Dugout Canyon Mine in 2007. Future surface disturbance of these leases will be permitted as needed to facilitate mining activities.

Appendix 4-4 in the M&RP and in the confidential folder contains letters authorizing land use by Dugout Canyon Mine for data collection, exploration and degasification drilling and water monitoring

#### **411 Environmental Description**

A statement of the conditions and capabilities of the land to be affected by coal mining and reclamation operations follows in this section.

#### **411.100 Premining Land Use**

The permit area has been primarily utilized as rangeland for livestock and wildlife habitat. Some crops related to the livestock industry have been developed along the creek bottoms adjacent to Soldier Creek Road. However, no crops have been raised within the permit area. Recreational use of the permit area is limited due to lack of access through private property.

The predisturbed area boundary outlined on Plate 5-4 reflects disturbance prior to 1965. The boundary was compiled from a 1980 map of the pre-mining topography prepared by Eureka Energy Company. According to historical data the Dugout Canyon area was last mined in 1964.

Pace Canyon

Archaeological inventories in the area were completed in 1980 by AERC who surveyed the access road into Pace Canyon to the Snow Mine site which is the currently proposed location of the fan site facility. The proposed fan site does not encompass the mine itself, but merely the facility area associated with the Snow Mine. The Snow Mine (42CB292) facility was active in 1906 but had its primary production period from 1932 - 1940. When inventoried the site was in moderately fair condition and avoidance was recommended in the 1980 inventory, however the site was **not** recommended for nomination to the National Register of Historic Places (Hauck & Weder: 1980). During an inventory by Senco-Phenix in 2001 the BLM requested a second evaluation of the Snow Mine site utilizing current National Register of Historic Places (NRHP) criteria. Senco-Phenix recommendation was "the area has been heavily logged since the initial recordation and the area around the mine extensively disturbed by heavy equipment, probably dozed. The foundation has been destroyed and the coal loadout has been collapsed and pushed into the bed of Pace Creek. The rock-covered adit and adjacent stonewall are still there on the other side of Pace Creek (east).....Other than recent trash no artifacts were observed. The integrity of the site has been basically destroyed. The site is not recommended for the NRHP" (Senulis: 2001). The 2001 evaluation also stated "no historic properties will be affected and no further cultural resource inventory is necessary".

In October 2003, Senco-Phenix performed an additional survey of the Snow Mine area in conjunction with a exploration drilling project proposed and approved by the BLM in 2003. The surveys mentioned in this section are on file with the BLM an/or in the Confidential Binder.

**411.110 Land Use Map**

Plate 4-1 designates the prominent land uses within and adjacent to the permit boundary. Pace Canyon has a corral just above a locked gate in Section 25, Township 13 South Range 12 East (Plate 4-1). The main livestock watering source is Pace Creek and it's tributaries in Sections 19, 20, 21 and

22, Township 13 South Range 13 East (Plate 4-1) and the Clark's Valley Reservoir, approximately 3 miles southwest of the Pace Fan Portal site (outside of area covered by Plate 4-1).

#### **411.120 Land Capability**

The area surrounding Dugout Canyon supports a variety of land uses including industrial, agricultural, and recreational. Carbon County has zoned the permit area for mining and grazing.

Energy resource development occurs throughout the region in the form of coal mining, oil and gas production and tar sands development. A methane gas recovery operation was formerly running in conjunction with the Soldier Canyon Mine which lies west of the Dugout Canyon Mine permit boundary. The Soldier Canyon Mine has been in operation since 1976.

The major plant communities in the Dugout Canyon lease area are identified in Section 321. No cultivated lands lie within the permit boundary, due to the limiting terrain and lack of water for irrigation. Refer to Section 321.100 for forage production per acre.

The permit area is used for grazing cattle, but sheep have grazed in the area previously. Valley bottoms receive little grazing due to their limited forage and narrowness except in the vicinity of water sources. Steep slopes receive limited grazing pressure from livestock because of the steep inclines and the lack of water. Flatter mesa tops and rolling terrain receive heavier pressure because of easier movement by livestock and more available forage. Grasses are preferred forage for cattle; however, cattle will eat forbs and shrub species.

The use of land for grazing is dictated by the condition of and access to the specific areas. At the land owners discretion land may be used for grazing one year and not used again for five years. However, grazing should continue to be considered a potential land use for the permit and adjacent areas.

The permit area supports limited recreation due to inaccessibility to privately owned lands.

#### **411.130 Land Use Description**

The permit area lies within undeveloped lands used primarily as wildlife habitat and for livestock grazing. Five grazing allotments are located in or adjacent to the permit area (Plate 4-1). The allotments support 429 head of cattle from May through October. The grazing allotments as listed below are administered by the U. S. Bureau of Land Management (BLM): Pine Canyon Allotment No. 24089 supports 50 head of livestock, Dugout Allotment No. 34039 supports 60 head, Pole Canyon Grazing Allotment No. 34092 supports 144 head, Cow Canyon Allotment No. 34032 supports 95 head, and Pace Canyon Allotment No. 24085 supports 80 head of livestock. The grazing allotment within the vicinity of the fan portal facilities is the Pace Canyon Allotment No. 24085, both the existing road and proposed facility site occur within this allotment. The existing Pace Canyon road passes near the main watering sources and holding corral for livestock on this allotment.

Recreation in the permit and adjacent areas includes camping, hunting, and hiking from Spring to late Fall. Recreational use is light due to restricted access to privately-owned lands. There are no developed or inventoried recreation campgrounds within the permit boundary. No impact is expected to the current recreational uses of the area. SCM will preserve these uses into the postmining period.

During deer and elk hunting seasons, the accessible lands are used extensively by the public. Fishing is limited at best, with restricted access and no known game fish populations existing in the permit area streams.

Logging operations completed in 1996 by Cascade Resources within and adjacent to the permit boundary are shown on the Sale Area Map "Exhibit A" in Appendix 4-2. Exhibit A was prepared by Cascade Resources of Wellington, Utah who estimated harvesting six million board feet from the areas designated on the exhibit. Their logging contract expired on 12/31/96.

Timber within the disturbed area is very limited and therefore not economical for recovery by the logging industry. Exhibit B included in Appendix 4-2 shows SCM's timber inventory including areas logged and areas yet to be logged.

The nearest crop production (alfalfa) is approximately 4 miles southwest of the permit boundary adjacent to the Soldier Creek Road. Cultivation occurs on a year to year basis, depending upon the water available for irrigation.

#### **411.140 Cultural and Historic Resources Information**

Cultural resource information and maps identifying cultural and historical study areas are located within the confidential folder of information pertaining to this permit. An intensive cultural resource evaluation of the permit area has been conducted by Dr. Richard Hauck, Ph.D. of Archeological-Environmental Research Corporation (AERC). As part of this evaluation he also made a record search at the State Historic Preservation Office (SHPO) and the National Register of Historic Places (NRHP).

Cultural resource evaluations were performed on two sites within the permit boundary. Field evaluations on the historic Dugout Creek Mine (42CB 205/291) and on a prehistoric rock art site (42CB 92) were conducted by the AERC staff on November 20 - 22, 1995. Site 42CB 92, situated in the SE1/4 of Section 22, T13S, R12E, contains a series of pictograph panels first documented by Dale Berge in 1977. The historic Dugout Creek Mine locus is situated in the NW1/4 of Section 23.

The historic components of the Dugout Creek Mine (42CB 205/291) are not considered to be significant and do not need to be avoided or mitigated prior to the development of the mine site. The prehistoric rock art site (42CB 92) is a significant resource and is eligible for nomination to the NRHP. Site 42CB 92 has been reported to the NRHP and BLM offices during previous cultural and historical studies of the area in 1977, 1980, and 1995 but is not currently listed on the NRHP.



The rock art panels are unstable and could be destroyed if blasting for road expansion is done within a 600-foot radius of the panels. SCM will make every effort to protect these rock art panels without drawing unnecessary attention to their location. The panels have been preserved primarily because the general public does not know of their existence. SCM will strive to maintain this condition.

The AERC report provides descriptive and valuational information for the two sites.

Cultural and historical inventories associated with the SITLA lease tract and adjacent areas are located in Appendix 4-1 and 4-3. This information should be held confidential by the Division.

The information in Appendix 4-3 was collected starting in 1980 and the last report was completed in 2003. According to information collected from the Price office of the BLM on March 23, 2004 and conversations with Mr. David Miller, there were no sites with artifacts considered for registration found in the areas surveyed and reported in 1980 through 1991. The conclusions were the same in the surveys conducted in 2001 - 2003. A letter from John Senulis, Archeologist with Senco Phenix detailing their file search and surveys of the area has been incorporated into Appendix 4-3. The letter is addressed to Kenny Wintch, the SITLA Archeologist and a copy has been sent to Mr. Dykman at SHPO. The letter states " No sites eligible for nomination to the National Register of Historic Places have been found in or adjacent to the permit expansion area. It is very unlikely that future survey will reveal sites eligible.....Furthermore all activity will be underground with no surface disturbance. For these reasons a finding of "no effect on historic properties" is appropriate and archeologic clearance without stipulations is recommended."

Federal Lease Modification U-07064-027821 and ML-50582-OBA

Senco-Phenix (Archeological Consulting Services) conducted a Class 1 file search for the NW1/4NW1/4, Section 21, Township 13S, Range 13E (approximately 40 acres). The 40 acres has privately owned surface and federal coal.

The Class 1 file search results listed a survey in 2006 conducted by Senco-Phenix which included a walking survey of a portion of the NW1/4NW1/4, Section 21, Township13S Range 13East. The survey area and a road surveyed in 2005 are shown on a drawing attached to a letter addressed to Vicky Miller, dated January 23, 2007 from Senco-Phenix. Copies of the letter and drawing have been provided to the Division for inclusion into Appendix 4-1 of the confidential folder as has a copy of the walking survey listed in the letter. **No cultural resources** were located during either of the surveys located by the file search, listed in the aforementioned letter.

During the June of 2007, an area of 580 acres were surveyed by Senco Phenix, an intensive walking survey was performed on 270 of these acres. The area surveyed includes parts of Section 16, 17, 18 and 21, T13S, R13E. A record search was performed on June 19, 2007. The cultural resource located during the study was in the form of an isolated aspen art inscription, **no other cultural resources** were located during the survey.

**Cultural and Historic Resource Maps.** Maps and photographs for the evaluated cultural and historical sites are contained in the confidential folder.

There are no cemeteries, public parks, or units of the National System of Trails or the Wild and Scenic Rivers System located within the Dugout Canyon Mine permit boundary. The National Register of Historic Places was consulted by AERC and no registered historic or prehistoric properties will be affected by the proposed mine development.

SCM agrees to notify the Division and SHPO of previously unidentified cultural resources discovered in the course of mining operations. Arch Coal Company has a registered professional geologist on staff assigned to Dugout Canyon Mine available to confirm vertebrate fossil material discovered during earth moving activities during construction of the Pace Canyon Fan Portal site. SCM also agrees to have any such cultural resources evaluated in terms of NRHP eligibility criteria. Protection of eligible cultural resources will be in accordance with Division and SHPO requirements. SCM will also instruct its employees that it is a violation of federal and state laws to collect individual artifacts or to otherwise disturb cultural resources.



**Coordination with State Historic Preservation Officer.** AERC contacted SHPO concerning the Dugout Canyon Mine site and a copy of their report was forwarded to SHPO. The National Register of Historic Places was consulted by AERC and no registered historic or prehistoric properties will be affected by the proposed mine development.

#### **411.200 Previous Mining Activity**

Coal mining has occurred within Dugout Canyon since 1925. D. J. Collins prospected for and initially hand-developed the Red Glow Mine in the Gilson seam on the east side of Dugout Canyon in 1925. The west side of Dugout Canyon was first mined in 1952 by E.S.O. Coal Company when they mined the Rock Canyon seam.

The Knight Ideal Coal Company mined the Rock Canyon and Gilson coal seams located on both sides of the canyon between 1958 and 1964. Knight Ideal Coal Company extracted 1,326,000 tons of coal by conventional room and pillar method with partial pillar recovery. The area in Dugout Canyon disturbed by mining has changed hands through the years but no coal has been extracted since 1964.

Limited exploration within existing portals was conducted by Pacific Gas and Electric in 1979 and by Sunedco in 1982. Following each exploration, the portals were resealed with earthen fill. During 1995, SCM reopened four portals, two on the east and two on the west side of Dugout Canyon. The portals on the east side were resealed but the portals on the west side were left open and fenced for security and safety.

Remnants of the Fish Creek and Pace Canyon Mine which operated in the early 1900's also exist within the permit boundary. Both mine sites have been considered for preservation by SHPO but were ineligible for nomination to the National Register of Historic Places. Pace Canyon contains the remains of earlier mining, disturbance by logging activities, and road access disturbance. The area was neither reclaimed or revegetated following the aforementioned disturbance.

## **412 Reclamation Plan**

### **412.100 Postmining Land Use Plan**

All uses of the land prior to mining and the capability of the land to support prior alternate uses will remain available throughout the life of the mine except within the disturbed-area boundary.

SCM intends the postmining land use to be consistent with the present land use, which is livestock grazing and wildlife habitat. Final reclamation activities such as grading and seeding as detailed within this M&RP will be completed in a manner to provide lands able to parallel the premining land use. In areas where surface disturbance will result from mining operations, soil reclamation and revegetation will restore the areas to wildlife habitat and livestock grazing capabilities.

The activities associated with the mining operation will follow accepted standards or proven techniques. Erosion hazards will be minimized and, where possible, eliminated. Evidence of abandoned improvements will be removed. Reclamation will restore the land and vegetation to as near a natural and productive condition as possible.

Efforts to restore wildlife habitat are discussed in Chapter 3 of this M&RP. Specific periods of habitation by wildlife species of the disturbed and adjacent area are discussed in Appendices 3-2 and 3-3. Since the disturbed area is privately owned the timing and extent of use for grazing will be made after reclamation by the landowner.

### **412.200 Land Owner or Surface Manager Comments**

The land surface within the permit boundary is owned by various entities, including the State of Utah and Canyon Fuel Company, LLC (CFC). The disturbed area is on surface lands owned by both CFC, BLM and the State.

The leases contained in Appendix 1-1 list responsibilities accepted by CFC in regard to the State of Utah's lands within the permit boundary. The leases contain requirements concerning use and maintenance of their administered lands. CFC is obligated by these leases to notify the Division for their determination as to whether this mining operation will be detrimental to the State of Utah's interest. By submitting this M&RP, CFC is indicating that the operation will not be detrimental to the State's interests and the obligation is being met. A letter of affirmation from the State of Utah concerning proposed land use is included in Appendix 4- 2.

The Bureau of Land Management (BLM) Right-of-Way application (UTU-76601) in Appendix 1-3 lists the responsibilities accepted by CFC concerning the BLM lands included in the permit boundary. A letter from the BLM concerning proposed land use for Pace Canyon Fan Portal area and UTU-76601 will be included in Appendix 4-2.

Refer to Chapter 1 for responsibilities CFC accepts in association with Federal Lease U-07064-027821.

For clarification as to relationship of SCM to CFC, refer to Section 112.

#### **412.300 Suitability and Capability**

Final fills will not contain excess spoils.

#### **413 Performance Standards**

The performance standards for the areas to be reclaimed for postmining land use are contained in this section.

#### **413.100 Postmining Land Use**

Postmining land uses are discussed in Section 412.100. The postmining lands will be reclaimed in a timely manner and capable of supporting such land uses (see Chapters 2, 3, 5, and 7). The postmining roads are discussed in Section 542.600.

#### **413.200 Determining Premining Uses of Land**

Postmining land uses will be as stated in Section 412.

#### **413.300 Criteria for Alternative Postmining Land Uses**

No alternative postmining land uses have been planned.

#### **414 Alternative Land Use**

No alternative postmining land uses have been planned.

### **420 AIR QUALITY**

This section includes descriptions of plans to comply with the Clean Air Act and applicable Utah or federal statutes and regulations pertaining to air quality standards.

Dugout Canyon Mine (called the Sage Point-Dugout Canyon Mine under previous ownership by Eureka Energy Company) was granted a PSD permit by EPA on December 17, 1979. On February 12, 1982 the EPA approved air quality regulations adopted by the State of Utah. Subsequently, an Approval Order (AO) was issued on September 28, 1983 by the Utah Air Conservation Committee for the Sage Point-Dugout Canyon Mine. However the planned mining operations were never implemented.

Information collected for the PSD and the 1983 AO have been submitted to the Utah Division of Air Quality in a request for an amended approval order. This amendment was requested because

of a change in surface equipment and a decrease in proposed coal removal from 5.2 million tons to 2 million tons per year.

#### **421 Air Quality Standards**

Dugout Canyon's mining activities will be conducted in compliance with the requirements of the Federal Clean Air Act and the Utah Air Conservation Rules.

#### **422 Compliance Efforts**

No mining activities will be conducted without a current AO from the Utah Division of Air Quality (DAQ). All activity will be conducted in compliance with the conditions established in the AO. A Notice of Intent (NOI) to construct has been submitted in accordance with DAQ document "Preparing Your Notice of Intent". Preconstruction conferences will be held as required by DAQ personnel. Emissions will be estimated using procedures and factors supplied by DAQ. A copy of the Approval Order and supporting information can be found in Appendix 4-1.

#### **423 Monitoring Program**

An NOI was submitted to DAQ requesting approval for a production rate of 7 million tons per year. This rate exceeds immediate production plans, but approval at this level will preclude the necessity of reapplying if future production plans should increase. This approach is appropriate since an AO is subject to specific operating conditions rather than to a time period and thus does not expire at the end of a 5-year period as does the approval of the mining permit. If operating conditions change sufficiently to invalidate the AO, a new NOI will be prepared.

The operating conditions are specified in the NOI and form the basis of the AO. All monitoring requirements and fugitive dust control practices as established by the AO will be followed by SCM. Should additional requirements be established under the provisions of R645-301-244.100 or R645-301-244.300, these requirements will also be followed by SCM.

#### **424 Fugitive Control Plan for Production Rates Less than One Million Tons Per Year**

During startup, or other situations where production is less than one million tons per year, the same procedures established in Section 423 will be followed and will be subject to the conditions of the AO issues by DAQ. See Section 523 of this M&RP for coal extraction estimates for the first 5 years of mining.

#### **425 Additional Division Requirements**

Should an air quality monitoring program be required by the Division while operating at a production rate of less than one million tons per year, SCM will provide sufficient data to judge the effectiveness of the fugitive dust control plan.

Canyon Fuel Company, LLC  
SCM/Dugout Canyon Mine

Mining and Reclamation Plan  
October 15, 2007 ~~March 7, 2007~~

**REFERENCES:**

Berge, D. L., 1976. The archaeological potential of the sage point coal mine, surface facilities and railroad spur, central Utah.

Division of Air Quality, 1994. Preparing Your Notice of Intent, Fifth Edition.

Hauck, F.R. and Dennis G. Weder, 1980. Intensive archeological surface evaluations of the proposed Sage Point-Dugout Canyon project in Carbon County, UT. Archeological Environmental Research Corporation paper No. 19. Salt lake city, UT.

Julander, O. 1955. Deer and cattle range relations in Utah. Forest Science 1 (2):130-139.

**CHAPTER 5**  
**ENGINEERING**



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## **CHAPTER 5 ENGINEERING**

### **510 INTRODUCTION**

This chapter provides a discussion of general engineering aspects, an operation plan, a reclamation plan, design criteria, and performance standards related to the Dugout Canyon Mine. The proposed coal mining and reclamation activities associated with the mine have been or will be designed, located, constructed, maintained, and reclaimed in accordance with the operation and reclamation plans.

Additional information can be found in the following amendments: Methane Degassification Amendment (August 2003), Refuse Pile Amendment (February 2003), and the Leachfield Addendum A-1 (March 2001). The remainder of the State Lease ML-48435-OBA (SITLA Lease) was incorporated into the Dugout Canyon Mine permit area in 2005. In 2007, 40 acres was added to Federal Coal Lease U-07064-027821 to accommodate a revised mine plan. Refer to Plate 5-7 for the location of the acreage (NW1/4NW1/4, Section 21, Township13S, Range 13E) incorporated into the permit boundary. Surface disturbance will be permitted as needed to facilitate mining activities.

In 2007 acreage (487.57 acres) was added to existing Federal Coal Lease U-07064-027821, two hundred and forty-seven acres of this added acreage is already included as part of the Dugout permitted area. Acreage was previously added to the permit area in excess of the Federal leased acreage to act as a subsidence buffer zone (207 acres) and to accommodate a revised mine plan (40 acres). In addition, State Lease ML-50582-OBA (320 acres, more or less) was issued to Dugout Canyon Mine in 2007. Future surface disturbance of these leases will be permitted as needed to facilitate mining activities.

### **511 General Requirements**

This permit application includes descriptions of the proposed coal mining and reclamation operations together with the appropriate maps, plans, and cross sections. Potential environmental impacts as well as methods and calculations utilized to achieve compliance with the design criteria are also presented.

Canyon Fuel Company, LLC  
SCM/Dugout Canyon Mine

Mining and Reclamation Plan  
October 15, 2007 ~~March 7, 2007~~

**APPENDIX 5-12**

Miscellaneous Information - ~~40-Acre~~ Permit Area Expansion

CHAPTER 7  
HYDROLOGY

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## CHAPTER 7 HYDROLOGY

### 710 INTRODUCTION

#### 711 General Requirements

This chapter presents a description of:

- Existing hydrologic resources within the permit and adjacent areas;
- Proposed operations and the potential impacts to the hydrologic balance;
- Methods of compliance with design criteria and the calculations utilized to show compliance;
- Applicable hydrologic performance standards; and
- Hydrologic reclamation plans for the Dugout Canyon Mine.

Additional information can be found in the following amendments: Methane Degassification Amendment (August 2003), Refuse Pile Amendment (February 2003), and the Leachfield Addendum A-1 (March 2001). The remainder of the State Lease ML-48435-OBA (SITLA Lease) was incorporated into the Dugout Canyon Mine permit area in 2005. ~~In 2007, 40 acres was added to Federal Coal Lease U-07064-027821 to accommodate a revised mine plan.~~ Refer to Plate 1-2 for the location of the acreage incorporated into the permit boundary.

The probable hydrologic consequences associated with construction of the AMV Access Road are addressed in the Methane Degassification Amendment, Wells G-1 through G-19 and G-31.

In 2007 acreage (487.57 acres) was added to existing Federal Coal Lease U-07064-027821, 240 acres of this added acreage is already included as part of the Dugout permitted area. Acreage was previously added to the permit area in excess of the Federal leased acreage to act as a subsidence buffer zone (207 acres) and to accommodate a revised mine plan (40 acres). In addition, State Lease ML-50582-OBA (320 acres, more or less) was issued to Dugout Canyon Mine in 2007. Future surface disturbance of these leases will be permitted as needed to facilitate mining activities.

## **712 Certification**

All maps, plans, and cross sections presented in this chapter have been certified by a qualified, registered professional engineer.

## **713 Inspection**

Impoundments associated with the mining and reclamation operations will be inspected as described in Section 514.300 of this M&RP.

## **720 ENVIRONMENTAL DESCRIPTION**

### **721 General Requirements**

This section presents a description of the pre-mining hydrologic resources within the permit and adjacent areas that may be affected or impacted by the proposed coal mining and reclamation operation.

### **722 Cross Sections and Maps**

#### **722.100 Location and Extent of Subsurface Water**

A generalized hydrostratigraphic cross section of the permit and adjacent areas is presented in Figure 7-1. A description of baseline groundwater conditions within the permit and adjacent areas, together with appropriate cross sections and maps as well as a discussion of seasonal variations in water levels, is provided in Section 724.100 of this M&RP.

#### **722.200 Location of Surface Water Bodies**

A description of baseline surface-water conditions within the permit and adjacent areas, together with appropriate maps and cross sections, is provided in Section 724.200 of this M&RP. A map showing the location of surface-water bodies (such as stream, ponds, and springs) for which water rights exist or for which there are pending water rights applications is provided as Plate 7-2. A listing of water rights is presented in Appendix 7-1. Other than for the indicated springs, no water rights exist for groundwater in the permit or adjacent areas.

### **722.300 Locations of Monitoring Stations**

Surface water and groundwater monitoring stations from which data have been collected within the permit and adjacent areas of the Dugout Canyon Mine are located as shown on Plate 7-1. Approximate surface elevations of the monitoring stations are also indicated by the topographic contours provided on Plate 7-1.

### **722.400 Location and Depth of Water Wells**

~~The~~ A Gilson water supply well is located approximately 450 feet southwest of the water tanks along the side of the water tank access road. The well depth is 300 feet and intercepts water collecting in the Gilson seam at the location shown on Plate 7-5. Groundwater monitoring wells in the area are located as shown on Plate 7-1. Depths of these wells and other completion details of the monitoring wells are summarized in Table 7-1. Refer to Appendix 7-9 for details pertaining to the Gilson water well.

### **722.500 Surface Topography**

Surface topographic features in the permit and adjacent areas are shown on the base map used for Plate 7-1.

## **723 Sampling and Analysis**

Where possible, all water samples collected for use in this M&RP have been analyzed according to methods in either the "Standard Methods for the Examination of Water and Wastewater" or 40 CFR parts 136 and 434. Where feasible, these same references have been used as the basis for sample collection.

## **724 Baseline Information**

Surface water, groundwater, and climatic resource information is presented in this section to assist in determining the baseline hydrologic conditions which exist in the permit and adjacent areas. This information provides a basis to determine if mining operations can be expected to have a significant impact on the hydrologic balance of the area.



#### **724.100 Groundwater Information**

This section presents a discussion of baseline groundwater conditions in the permit and adjacent areas. The location of wells and springs in the mine area are presented on Plates 7-1 and 7-2. The wells in the mine area are all water monitoring wells except for the Gilson water well. No additional water supply wells have been identified. Water rights for the mine and adjacent areas are addressed in Section 722.200 of this M&RP. All groundwater use (seeps and springs) within the permit and adjacent areas is confined to wildlife and stock watering.

Table 7-2 provides a summary of the period of record and selected additional information regarding groundwater sources that have been monitored within the permit area and the nearby vicinity. These sources include wells, springs, and mine-water inflows from the Soldier Canyon Mine. The geologic source for the springs presented in Table 7-2 was determined by comparing Plates 6-1 and 7-1. These data have been collected from over 100 locations within the permit and adjacent areas beginning as early as 1976 and extending through the present, as indicated in the data base contained in Appendix 7-2.

The data provided in Appendix 7-2 were obtained from multiple sources, including (but not limited to) the Soldier Creek Coal Company M&RP and annual reports, U.S. Geological Survey publications, the Sage Point-Dugout Canyon permit application filed by Eureka Energy Company in 1980, Appendix 7-3 of this M&RP, and various consultant reports. Since not all monitoring parties were responsible to adhere to UDOGM or SMCRA rules, the laboratory parameters varied between reports. However, the data are still considered valid and appropriate for determining baseline conditions within the permit and adjacent areas. It should be noted that much of the manganese data presented in Appendix 7-3 represent total (as opposed to dissolved) concentrations.

Additional baseline and operational data for sampling sites within the SITLA tract addition to the Dugout Mine permit is also available on the Division's Electronic Water Monitoring Database.

A hydrologic evaluation of the area was published by Mayo and Associates (1996). This evaluation, which is presented in Appendix 7-3 of this M&RP was initially used together with published reports of the area and the extensive data base contained in Appendix 7-2, to prepare this description of baseline hydrologic conditions within the permit and adjacent areas. While the Mayo report does not specifically include the SITLA tract area, the geologic and hydrogeologic conditions within the tract are similar enough to the area studied by Mayo to assume the conclusions reached by Mayo would apply to the SITLA tract. An update to the PHC document



originally written by Mayo and Associates and included in Appendix 7-3 was prepared by the mine in October 2007 to address additional baseline data collected for the 600 acre expansion in the northeast portion of the permit area. The update also includes the results of surface and ground water monitoring by the mine since 1998. This information is included in Appendix 7-3 and titled "Update to the Probable Hydrologic Consequences of Coal Mining at the Dugout Canyon Mine".

### Groundwater Systems

Geologic conditions in the permit and adjacent areas are described in detail in Chapter 6 of this M&RP. Formal aquifer names have not been applied to any groundwater system in the permit and adjacent areas because the geometry, continuity, boundary conditions, and flow paths of the groundwater systems in the area are not fully understood. However, the data do suggest that groundwater systems in each of the bedrock formations are sufficiently different from each other to justify the informal designation of groundwater systems based on bedrock lithology. Thus, the informal designation of Colton, Flagstaff, North Horn, Price River, Blackhawk, Star Point, and Mancos groundwater systems is adopted herein.

Groundwater in the permit and adjacent areas occurs within perched aquifers overlying the coal-bearing Blackhawk Formation as well as within the Blackhawk Formation and the underlying Star Point Sandstone. Hydrogeologic conditions within the permit and adjacent areas are summarized below.

Colton Formation. The Colton Formation outcrops in the northeast portion of the permit and adjacent areas. This formation consists predominantly of fine-grained calcareous sandstone with occasional basal beds of conglomerates and interbeds of mudstone and siltstone. Data presented in Table 7-2 and Appendix 7-2 indicate that 6 springs issue from the Colton Formation within the permit and adjacent areas.

Waddell et al. (1986) evaluated the discharge of spring G-96 for the period of June to September 1980. At spring G-96 the measured discharge rate declined from 103 to 6.3 gpm during the 4-month period of evaluation. The slope of the hydrograph recession curve (which provides a relative index of the seasonal variability of discharge) was calculated by Waddell et al. (1986) to be 24 days per log cycle for the initial slope following snowmelt (designated as "S1") and greater than 365 days per log cycle for base-flow conditions (designated as "S2"). This suggests that, at this location, the groundwater system has a good hydraulic connection with surface recharge and that most of the annual recharge quickly drains out of the system.

Groundwater issuing from the Colton Formation has a total dissolved solids ("TDS") concentration of 300 to 500 mg/l (as measured by specific conductance and laboratory analyses of TDS). The pH of this water is slightly alkaline (7.5 to 8.1). ~~Insufficient data are available to describe seasonal variations in these parameters.~~ Collected data suggests TDS concentrations do not significantly vary seasonally. The pH of the water appears to shift toward becoming more alkaline during periods of drought.

Based on one sample collected from G-96, the water is a calcium-magnesium-bicarbonate type (see Figure 7-2 and Appendix 7-2). This solute composition is consistent with the dissolution of calcite and dolomite in the presence of soil-zone carbon dioxide, together with ion exchange. The G-96 data also indicated a dissolved iron concentration of 0.02 mg/l. No total iron or manganese data are available for this spring. Samples obtained and analyzed from springs SC-65 and 260 support the conclusions the water discharging from the Colton Formation is a calcium-magnesium-bicarbonate type.

Flagstaff Formation. The Flagstaff Formation outcrops across much of the northern portion of the permit area. This formation consists of an interbedded sequence of sandstone, mudstone, marlstone, and limestone. Most springs and a major portion of the volume of groundwater discharging from the permit and adjacent areas issue from the Flagstaff Formation. According to Table 7-2 and Appendix 7-2, more than 40 springs issue from the Flagstaff Formation within the permit and adjacent areas.

Groundwater discharge rates for springs issuing from the Flagstaff Formation are greatly influenced by seasonal variations in precipitation and snowmelt, with most discharge corresponding to the melting of the winter snow pack during the spring months. Some springs in the Flagstaff Formation, which have been found to discharge 100 to 300 gpm following the spring snowmelt, decrease to flows of 15 gpm or less by the fall (Appendix 7-2). Many springs issuing from the Flagstaff Formation have been noted to dry up each year.

In an effort to quantify the seasonal variability of discharge rates of springs issuing from the Flagstaff Formation, Waddell et al. (1986) prepared hydrograph recession curves for several springs in the permit and adjacent areas. The hydrograph data summarized in Table 7-3 show an S1 recession average of 69 days and an average S2 recession 246 days. The longer duration of the S1 recession relative to the data collected from G-96 in the Colton Formation indicate that the storage capacity of the Flagstaff Formation is greater than that of the Colton Formation. Nonetheless, the data indicate that most of the annual recharge to the Flagstaff Formation drains out of the system within about two months, while the remainder of the annual recharge drains out

prior to the next snowmelt recharge event. This conclusion was verified by isotopic data collected by Mayo and Associates, 1996; Appendix 7-3).

The groundwater regime in the Flagstaff Formation appears to be influenced predominantly by the combined effects of lithology and topographic expression. Because the Flagstaff Formation forms **much of** the upland plateau of the permit and adjacent areas, this formation is capable of receiving appreciable groundwater recharge from precipitation and snowmelt.

Waddell et al. (1986) concluded that the Flagstaff groundwater system is perched. They indicate that approximately 9 percent of the average annual precipitation recharges the Flagstaff groundwater system and that recharge water entering the Flagstaff Formation moves downward until it encounters low permeability shale or claystone layers in the North Horn Formation, where almost all of the water is forced to flow horizontally to springs. The hydrograph and isotopic data support this conclusion

Data presented in Appendix 7-2 indicate that groundwater issuing from the Flagstaff Formation has a mean TDS concentration of 335 mg/l. This water tends to be slightly alkaline and, similar to conditions encountered in the Colton Formation, is of the calcium-magnesium-bicarbonate type (Figure 7-3). The solute compositions of these groundwaters appears to be dominated by the dissolution of calcite and dolomite in the presence of soil zone carbon dioxide, together with ion exchange.

The data presented in Appendix 7-2 indicate that the dissolved iron concentration of groundwater discharging from springs in the Flagstaff Formation is generally less than 0.1 mg/l. Total iron concentrations of this water are typically about one order of magnitude higher. Total manganese concentrations in Flagstaff groundwater are generally less than 0.03 mg/l. These data do not exhibit seasonal trends.

North Horn Formation. The North Horn Formation outcrops across the center of the permit and adjacent areas **but eventually pinching out in the eastern portions of the permit and adjacent areas.** This formation consists of interbedded sandstone and calcareous mudstone.

According to Table 7-2 and Appendix 7-2, 27 springs issue from the North Horn Formation within the permit and adjacent areas. Although the number of reported springs is large, the maximum measured discharge from most of these springs is less than 5 gpm and the total maximum measured discharge is small compared to the total maximum measured discharge from the Flagstaff Formation. Given the gradational nature of the contact between the North Horn

Formation and the overlying Flagstaff Formation (see Section 624.100), it is possible that some of the reported North Horn Formation springs may represent discharge from the lower part of the Flagstaff Formation.

Hydraulic and chemical conditions vary widely within the North Horn Formation. This variability caused Waddell et al. (1986) to conclude that water discharging from the North Horn Formation is probably recharged by upward leakage from the underlying formations, including the Blackhawk Formation. This conclusion was based on water levels in wells perforated in the Blackhawk Formation and on the solute chemistry of spring SP-10. However, this conclusion is considered to be in error since the Price River Formation and the Castlegate Sandstone, which are situated between the North Horn Formation and the Black Formation, are not saturated in the vicinity of Soldier Creek just downstream from SP-10. Furthermore, Soldier Creek loses water as it flows across the Price River Formation and the Castlegate Sandstone (see Waddell et al., 1986). Hence, the upward flow from the Blackhawk Formation does not appear to be the primary source of recharge to the North Horn Formation.

Sufficient data have been collected from two springs (SP-8 and SP-10) to provide diagnostic information regarding the groundwater system of the North Horn Formation in the permit and adjacent areas. The discharge from SP-8 is hydraulically and chemically similar to groundwater in the Flagstaff groundwater system. The spring exhibits substantial variability in discharge in response both to spring snowmelt events and to drought and wet years (Figure 7-4). Discharge rates as great as 20 gpm have been recorded from this spring during the high-flow season, and discharge rates as low as 1 gpm are not uncommon during late summer. The effects of the drought occurring in the late 1980s and early 1990s are clearly evident in the hydrograph.

Groundwater issuing from SP-8 typically has a mean TDS concentration that varies from 250 to 300 mg/l with a pH of 8.5 to 8.9. This water is of mixed cation-bicarbonate type (Figure 7-5 and is chemically distinct from most groundwater in the Blackhawk Formation.

Although spring SP-10 issues from the North Horn Formation, the spring may be fracture controlled and contain water from a deeper groundwater system. Although fracture systems have not been mapped on the surface in the vicinity of SP-10, the long-term hydrograph of SP-10 (Figure 7-4) is not consistent with hydrographs of "shallow-source" springs issuing from the Flagstaff, North Horn, or Price River groundwater systems, in that the discharge rate of SP-10 shows only limited seasonal variability.



According to Mayo and Associates (1996), the isotopic and solute compositions of SP-10 discharge water are more similar to groundwater encountered in the Blackhawk Formation. Groundwater discharging from SP-10 is of the sodium-bicarbonate type (Figure 7-5), which suggests that ion exchange of calcium and magnesium has occurred for sodium in a zone containing clay minerals or zeolites. This could occur in the Blackhawk Formation since the zeolite analcime has been identified in coal at the Skyline Mine located approximately 35 miles west of the proposed Dugout Canyon Mine (Mayo and Associates, 1994).

Groundwater issuing from SP-10 has an elevated sulfate content (Appendix 7-2 and Figure 7-5). In fact, this spring has been locally referred to as Sulfur Spring due to the odor of hydrogen sulfide gas which lingers in the air. The source of the gas is likely near-surface sulfate reduction caused by bacterial activity (Appendix 7-3). Sulfate reduction is consistent with the measured reducing potential of the water (Appendix 7-3).

According to information presented in Appendix 7-3, water issuing from SP-10 has a meteoric origin but an old age. Furthermore, the data indicate that water issuing from SP-10 is similar to water encountered in Soldier Canyon Mine, suggesting that the water issuing from the spring is mixed with water from the Blackhawk Formation (Appendix 7-3).

The old age of groundwater issuing from SP-10 relative to water from other springs in the North Horn and overlying formations is confirmed by the mean radiocarbon age of the water which has been calculated as 10,000 years (see Appendix 7-3). As a point of comparison, a mean radiocarbon age of 21,500 years has been calculated for a groundwater sample collected from the Blackhawk Formation in the 3rd West pillar area inside Soldier Canyon Mine (see Appendix 7-3).

It is likely that groundwater discharging at SP-10 flows upward from depth along a fracture. The major water-bearing fracture identified in the Soldier Canyon Mine is approximately coincident with the location of SP-10, validating this conclusion (see Appendix 7-3).

Wahler Associates (1982) indicate that monitoring well GW-19-1 (Plate 7-1) was initially completed within the North Horn Formation. However, according to Waddell et al. (1986), the well was initially unperforated and was then perforated on two separate occasions (first opening the well to the North Horn Formation and then later to the underlying Price River Formation, Castlegate Sandstone, and Blackhawk Formation). As a result, water levels have reportedly varied significantly in the well over very short periods of time due to the various conditions within the well. Due to these changing well conditions and multiple-zone perforations, the data cannot be used to ascertain water-level fluctuations in the North Horn Formation. However, given the decrease in

water levels which occurred following the second round of well perforations (a decline in head of about 540 feet), it is apparent that the head in the North Horn Formation is several hundred feet greater than the composite head of the underlying formations. This suggests that groundwater in the North Horn Formation is probably not in significant hydraulic connection with groundwater in the underlying formations.

The data presented in Appendix 7-2 indicate that the dissolved iron concentration of groundwater issuing from the North Horn Formation is generally less than 0.07 mg/l. Total iron concentrations of this water is slightly higher. Total manganese concentrations in North Horn groundwater are generally less than 0.02 mg/l. These data do not exhibit seasonal trends.

Price River Formation. The Price River Formation consists of interbedded mudstone and siltstone with some fine-grained sandstone and carbonaceous mudstone. Within the permit area, no springs have been found issuing from the Price River Formation, suggesting that it is not a significant aquifer. The absence of springs is of great significance, since this formation is situated between the overlying Flagstaff groundwater system and the underlying coal zone (in the Blackhawk Formation). The absence of springs is most likely the result of two factors: 1) clay horizons in overlying formations inhibit vertical recharge from groundwaters in the Flagstaff and North Horn Formations, and 2) the exposed recharge area of the Price River Formation is limited primarily to areas of steep cliff faces.

Wahler Associates (1982) indicate that monitoring well GW-11-2 (Plate 7-1) is completed within the Price River Formation. Data collected from this well (Appendix 7-4) indicate that water levels varied by approximately 8 feet during the period of December 1979 through November 1982, but showed no consistent trend. A measurement collected in September 1995 indicated that the water level was 1.2 feet lower than the last time it was measured nearly 13 years earlier. Hence, although a slight decline in water levels has occurred during the period of record, this decline is not considered significant. *Since 1997, when this well became part of the mine's monitoring program, the water level dropped approximately 8 feet until 2005 when it rose about 12 feet. Mining activities do not appear to be the cause of the rise and fall of the water level within the well nor do cycles between wet and dry periods. The cause for these changes are unknown at this time.*

Castlegate Sandstone. The Castlegate Sandstone consists of a fine- to medium-grained sandstone that is cemented with clay and calcium carbonate. The outcrops of this sandstone form prominent cliffs in the area.

Data presented in Table 7-2 and Appendix 7-2 indicate that only two springs (SC-80 and SC-81) have been found issuing from the Castlegate Sandstone within the permit and adjacent areas. ~~Therefore, this formation is not considered to be a significant aquifer.~~ The flow of these springs was 1 gpm or less in September 1995, with no measurable flow being observed in October 1995. Based on specific conductance measurements collected from these springs, the TDS concentration of water issuing from the Castlegate Sandstone varies from about 360 to 430 mg/l. The water is slightly alkaline, with a pH of 7.7 to 8.0. Subsequent field studies found another spring, 227, that appeared to discharge from the Castlegate Sandstone. However, since this site was added to the water monitoring program, this spring has not had measurable discharge. Therefore, this formation is not considered to be a significant aquifer.

Wahler Associates (1982) indicate that monitoring wells GW-10-2 and GW-24-1 (Plate 7-1) are completed in the Castlegate Sandstone. With the exception of early measurements which were likely influenced by the presence of drilling fluids prior to perforation of the casing (Waddell et al., 1986), data collected from GW-24-1 indicate that water levels varied by 4.5 feet during the period of March 1980 through November 1982 (Appendix 7-4), but no consistent trend was noted. The cap could not be removed from this well for a water-level measurement in September 1995. During the Winter of 1999-2000, Monitoring Well 24-1 became blocked. The water level in the well has been inaccessible since that time and was permanently removed from monitoring after the 4<sup>th</sup> Quarter of 2004.

Data collected from GW-10-2 indicate that water levels have declined approximately ~~20~~30 feet during the ~~45~~27-year period of record following an initial stabilization of drilling fluids after casing perforation (January 1980 through ~~September 1995~~ May 2007). The rate of this decline has been gradual.

The potentiometric surface of groundwater flow in the Castlegate Sandstone is to the north-northwest at an average gradient of 0.024 ft/ft based on measurements reported by Wahler Associates (1982) for November 1982. The datum reported for GW-11-2, under the assumption that the Price River Formation is in hydraulic connection with the Castlegate Sandstone was also used to determine the potentiometric gradient.

Groundwater recharge to the Castlegate Sandstone is from precipitation and snowmelt. However, as evidenced by the fact that the surface exposure of the Castlegate within the permit and adjacent areas is generally limited to steep cliffs within minimal horizontal surface area, total recharge is probably low. Recharge to the Castlegate Sandstone is further limited by the lack of significant

developed soil resources over the formation to encourage infiltration and the presence of low-permeability shales in the overlying Price River Formation (see Waddell et al., 1981).

Discharge from the Castlegate Sandstone probably occurs mainly as springs along the outcrop and as through-flow to the underlying Blackhawk Formation. As indicated above, spring flow from the unit is limited in flow and in occurrence. Besides the monitoring wells completed in the Castlegate Sandstone, no known wells are completed in the formation.

Blackhawk Formation. The Blackhawk Formation underlies the Castlegate Sandstone and consists of interbedded sandstone, siltstone, shale, and coal. The Rock Canyon and Gilson coal seams, to be mined by ~~SCM~~Dugout Canyon Mine, ~~is~~ are located in the lower portion of the Blackhawk Formation.

Only three springs have been identified as issuing from the Blackhawk Formation (SC-61, SC-62, and G-100 - see Table 7-2). Springs SC-61 and SC-62 issue near a stream channel in a tributary of Dugout Canyon. Limited data collected from these springs (Appendix 7-2) indicate that flows are typically less than 2 gpm, with a TDS concentration of 700 to 800 mg/l. The pH of this water is slightly alkaline (7.5 to 8.0).

Visits to spring G-100 in September and October 1995 indicated that this spring was dry on one visit and seeping at a sufficiently low rate on the second visit that it could not be sampled. Previous attempts by Mayo and Associates (1996) could not locate this spring. A sample collected by Waddell et al. (1986) indicated that water discharging from G-100 has a TDS concentration of approximately 650 mg/l and a pH of 7.2. The water is of the calcium-magnesium-bicarbonate-sulfate type (Figure 7-6). The solute composition of this water is chemically distinct from all other springs in the area. It has an elevated sulfate content relative to overlying groundwater and may be distinguished from Blackhawk Formation groundwater associated with coal seams inside Soldier Canyon Mine by its relatively low sodium and bicarbonate contents (Appendix 7-3 and Figure 7-6). The solute composition of water issuing from G-100 is consistent with the dissolution of calcite and dolomite in the presence of soil zone carbon dioxide and the dissolution of appreciable amounts of gypsum.

Four monitoring wells (GW-5-1, GW-6-1, GW-32-1, and G-58.5) have been completed in the Blackhawk Formation in areas north and northeast of the permit area (see Plate 7-1). As noted in Table 7-1, well GW-5-1 is perforated opposite the Sunnyside and Rock Canyon Coal seams in the Blackhawk Formation. Early water-level measurements in this well show the residual influence of drilling fluids in the hole immediately following casing perforation. Subsequently, in November



1982, Wahler Associates (1982) conducted a slug test in the well by filling it with water to within about 20 feet of land surface. Hence, early water-level measurements in this well are not indicative of hydraulic heads in the formation.

SCM began monitoring well GW-5-1 in June 1987. Between June 1987 and June 1993, water levels declined at a slow and nearly constant rate of about 0.02 ft/day (Figure 7-7). The initial water level in June 1987 was about the same as the water level prior to the slug test in 1982.

By mid-year 1993, development of the Soldier Canyon Mine, within the Sunnyside seam, had expanded to a point immediately adjacent to well GW-5-1. Well monitoring data show a slight rise in water level elevation between June 3, 1993 and August 24, 1993 which corresponded to mine development in the vicinity of the well. This rise in water level can be explained by the redistribution of vertical stress acting on the nearby coal (see Appendix 7-3). Following completion of the 1993 development, a sustained moist area was identified on the floor of the Soldier Canyon Mine No. 5 entry, adjacent to GW-5-1.

Furthermore, subsequent monitoring of the water level in the well indicated that, between August 24, 1993 and November 1, 1995, the average rate of water level decline increased to approximately 0.09 ft/day (an increase of about 4.5 times the previously observed rate). This decline was likely due to dewatering of the Blackhawk Formation in the immediate vicinity of the monitoring well.

Wahler Associates (1982) calculated a transmissivity of 0.009 gpd/ft ( $1.2 \times 10^{-3}$  ft<sup>2</sup>/day) from the falling-head slug test which they performed in GW-5-1. Sergeant, Hauskins & Beckwith (1986) reported transmissivities of  $2.3 \times 10^{-3}$  to  $6.7 \times 10^{-4}$  cm<sup>2</sup>/s ( $2.1 \times 10^{-1}$  to  $6.2 \times 10^{-2}$  ft<sup>2</sup>/day) for slug tests conducted in holes drilled into the Blackhawk Formation from within the Soldier Canyon Mine. Based on monitored thicknesses of 22 feet in GW-5-1 (Table 7-1) and 120.8 feet in each of the in-mine holes (Sergeant, Hauskins & Beckwith, 1986), the hydraulic conductivity of the Blackhawk Formation is calculated to vary from  $5.5 \times 10^{-5}$  to  $1.7 \times 10^{-3}$  ft/day, with a median of  $5.1 \times 10^{-4}$  ft/day.

Well GW-6-1 is perforated over a 200-foot long interval which includes the Sunnyside seam (see Table 7-1). Initial water level measurements collected from this well are believed to be associated with residual water remaining from drilling and casing operations and are, therefore, probably not representative of natural conditions. Water levels declined between November 1989 and August 1991 (Figure 7-7). From August 1991 through August 1993, water levels in GW-6-1 remained relatively stable at a depth of approximately 425 feet. Monitoring on June 3, 1994 found the well to be dry and plugged at a depth of approximately 470 feet. All subsequent attempts to monitor this well have found the plugged/dry condition unchanged.

Monitoring well GW-32-1 is perforated in the Blackhawk Formation immediately above the Sunnyside seam (see Table 7-1) in a location which is down dip of Soldier Canyon Mine workings. Water level monitoring information shows a fairly consistent rise in water elevation.

From November 1994 through August 1995, the water level appears to have stabilized at a depth of approximately 291 feet (Figure 7-7). There is no information at this time that would suggest that underground mining activities in the nearby Soldier Canyon Mine are effecting the water levels observed to date.

Monitoring well G-58.5 was completed by Mountain Fuel Supply Company into the Blackhawk Formation in 1979. Waddell et al. (1986) reported a depth-to-water in March 1980 in this well of 502.8 feet. Waddell et al. (1982) reported depths to water of 501.7 to 502.4 feet in April and September 1880. No additional water-level data are available for this well.

Attempts for this M&RP to construct a potentiometric surface for the Blackhawk Formation in the Soldier Canyon area based on data collected from GW-5-1, GW-6-1, and GW-32-1 proved fruitless. The difficulty in preparing this potentiometric surface may have been due to the influence of outcropping in the adjacent Soldier Canyon, the influence of mining in the nearby Soldier Canyon Mine, and/or varying lengths and stratigraphic locations of the perforated sections of the monitoring wells within the discontinuous strata which comprise most of the Blackhawk Formation. However, based on water-level data collected from one of the existing Dugout Canyon portals and from monitoring wells GW-5-1 and G-58.5, Waddell et al. (1986) concluded that the flow of groundwater in the Blackhawk Formation within the permit and adjacent areas is to the north away from the face of the cliffs (i.e., down dip as generally seen in the Castlegate Sandstone). They estimated the hydraulic gradient in the Blackhawk Formation to be 42 feet per mile (0.008 ft/ft). Waddell et al. (1986) indicate that the coal bearing zone to be mined in the Dugout Canyon operations will probably be saturated in most areas and will require dewatering during mining. However, since mining was initiated at the Dugout Mine, saturated coal zones have not been encountered. The majority of the water encountered during mining both the Rock Canyon and Gilson seams has entered the mine through the roof and as discharges from isolated sandstone channels within the Blackhawk Formation and from the roof and floor through fractures and minor faults.

Recharge to the Blackhawk Formation is of limited magnitude, due primarily to the limited area of exposure on steep outcrops and the presence of low-permeability units in overlying formations. Data presented in Appendix 7-3 indicate that Blackhawk Formation groundwater which discharges into the Soldier Canyon Mine is of ancient meteoric origin (greater than 20,000 years), thereby supporting the conclusion that the rate of recharge to the formation is minimal. Mayo and

Associates (1996) concluded that the old groundwater age and the isotopic compositions of water encountered in the Soldier Canyon Mine are evidence that the groundwaters are not part of actively flowing, shallow groundwater systems. The groundwater ages also demonstrate that the hydraulic connection between these old groundwaters and the overlying active (and younger) groundwater systems in the Flagstaff and North Horn Formations is very limited or does not exist.

The quality of groundwater in the Blackhawk Formation has been evaluated by Mayo and Associates (1996) based on data collected from leakage into the Soldier Canyon Mine (see Appendix 7-3). These data indicate that Blackhawk Formation groundwater has a mean TDS concentration of about 750 mg/l and is of the sodium-bicarbonate type (Figure 7-6). These waters are chemically distinct from groundwater in overlying groundwater systems. The solute compositions of mine groundwaters suggest a complex series of rock-water and gas-water reactions (Mayo and Associates, 1996).

The dissolved iron concentration of groundwater flowing into the Soldier Canyon Mine has historically been less than 0.5 mg/l and is generally less than 0.1 mg/l (see Appendix 7-2). The total iron concentration of this water has historically been less than 2.0 mg/l and generally less than 0.5 mg/l. The total manganese concentration of Blackhawk Formation water (as measured in the Soldier Canyon Mine) has historically been less than 0.5 mg/l and is typically less than 0.1 mg/l (see Appendix 7-2).

Four exploration holes (DUG0104, 0204, 0101, and 0201) were drilled within or immediately adjacent to the Dugout Canyon Mine SITLA Lease area and completed in the Blackhawk Formation. All holes were completed below the Gilson Coal Seam. No water was encountered in any of the exploration holes per personal communication with Mike Stevenson, Project Geologist, Ark Land Company, November 22, 2004.

Exploration Hole Number	Location (approximate)	Year Drilled
DUG0104	T13S, R13E, Section 20, NW1/4SE1/4	2004
DUG0204	T13S, R13E, Section 19, SE1/4NE1/4	2004
DUG0101	T13S, R13E, Section 30, NE1/4NW1/4	2001

DUG0201	T13S, R13E, Section 19, SE1/4SE1/4	2001
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Star Point Sandstone. In those locations where the Star Point Sandstone exists within the permit and adjacent areas, it consists of a fine-grained calcareous sandstone with layers of siltstone and mudstone. In keeping with regional practice (see Lines, 1985), the Star Point Sandstone and Blackhawk Formation are considered to be hydraulically connected. However, only one spring (SC-64) has been discovered issuing from the Star Point Sandstone within the permit and adjacent areas. The near absence of springs in this formation suggests that the Star Point does not receive appreciable annual recharge and that it does not support active groundwater systems in the area.

Recharge to the Star Point Sandstone probably occurs via leakage from the overlying Blackhawk Formation. Hence, this water is likely of ancient origin.

Data collected from SC-64 indicated that the discharge of this spring declined from 2 gpm to 0.5 gpm in the period of September 1995 to October 1995 (see Appendix 7-2). The TDS of this water, as estimated from the specific conductance data, is approximately 700 mg/l, with a pH of about 7.5.

Mancos Shale. The Mancos Shale is exposed south of the permit area. This formation is a relatively impermeable marine shale and is not considered to be a regional or local aquifer. Groundwater samples collected from four monitoring wells located approximately 2 miles south of Soldier Canyon Mine have a mean TDS concentration of approximately 10,000 mg/l and is of the sodium-sulfate-chloride type (Appendix 7-3). Chemical compositions are consistent with the dissolution of halite and gypsum as well as cation exchange.

#### Recharge and Discharge Relations

Recharge within the permit area occurs primarily on the exposed upland outcrops of the Flagstaff Formation and the North Horn Formation. Waddell et al. (1986) estimated that the annual recharge to the Flagstaff Formation is 9 percent of the total annual precipitation. Recharge is probably greatest where surface fractures intersect the topographic highs where the Colton, Flagstaff, and North Horn Formations outcrop. Recharge to the Blackhawk Formation and the Star Point Sandstone probably occurs primarily from vertical movement of water through the overlying formations. The rate of recharge to the Blackhawk Formation and the Star Point Sandstone is very slow, as evidenced by the ancient age of groundwater within those formations (see Appendix 7-3).



Assuming mass-balance and stable hydrologic conditions, recharge will equal discharge over the long term. The relatively young age of groundwater discharging from the Flagstaff and North Horn Formations as compared with the underlying Blackhawk Formation suggests that the stratigraphically-higher water discharges rapidly and is not hydraulically connected with the Blackhawk Formation. Waddell et al. (1986) conclude that the perched nature of the Flagstaff Formation protects it from the influence of dewatering of the coal-bearing zone unless the upper zone is influenced by subsidence.

Waddell et al. (1986) performed seepage studies in Pine Canyon (located immediately north of the permit area) and found that significant increases in the flow of Pine Canyon occur near the contact of the North Horn Formation and the overlying Flagstaff Formation. They concluded that downward percolation from the Flagstaff Formation is impeded by the claystones and mudstones of the North Horn Formation, forcing the water to move laterally and emerge along the outcrop in the canyon bottom.

#### Mining Impacts to Subsurface Water Resources

As presented previously, exploration drilling in the SITLA tract has not encountered significant volume of water in the Gilson seam or overlying strata. As discussed in previous paragraphs, the formations that overlie the coal seams do not include extensive units of rock that would form large aquifers. The Blackhawk Formation can discharge water from isolated channel sandstones in the roof of the mine. However, very few springs have been found on the surface in the Dugout Canyon Mine area that discharge from Blackhawk units. Springs that do discharge from the Blackhawk Formation typically have very low flows. In-mine flows that are encountered as a result of mining have typically discharged from the roof, are initially much less than 100 gpm, and have flow rates that decrease rapidly as mining progresses. The sandstone channels that hold water in the Blackhawk are typically lenticular, have low to moderately low transmissivity rates, of limited areal extent, and contain waters older than 50 years and typically older than a few thousand years. Since the Blackhawk Formation in the Dugout Canyon Mine area, including the SITLA Tract, is very similar throughout, it is unlikely that mining will encounter large volumes of water from isolated perched sandstone channel aquifers as coal is removed from the Gilson seam in the permit area as a whole.

Mining within the SITLA tract has recently encountered fractures and minor faults, a few containing ground water. Water initially discharges from these structures at a significant rate from floor and roof followed by a slow decline in flow rates. It is likely these fractures are draining both isolated

perched aquifers located near the roof of the mine but also sandstone channels containing water under potentiometric pressure beneath the mine floor.

The Price River and Castlegate Sandstone formations are also poor aquifers in the mine area as described in the previous sections. Only two springs have been found within the Dugout Mine area, including the SITLA tract, issuing from these formations. These formations do not conduct water readily, do not contain extensive aquifers, and do not appear to be saturated. Subsidence of these formations will not cause significant changes to subsurface water resources since these resources are apparently not present.

Water bearing strata within the North Horn and Flagstaff Formations (the contact between the two formations is indistinguishable in most of the SITLA tract) and the Colton Formation should not be significantly affected. Subsiding these formations may result in locally increased hydraulic conductivity within the strata but water loss to the underlying formations will be minimal, if at all. The fine grained units (siltstones and shales) that perch the aquifers within the North Horn/Flagstaff and Colton Formations should easily seal subsidence induced fractures and limit downward migration of water from the isolated aquifers. Additionally, the Price River Formation consists of interbedded mudstone, siltstone, and fine-grained sandstones. The finer-grained siltstone and mudstones would seal fractures within the formation and inhibit downward movement or loss of water from the North Horn/Flagstaff and Colton aquifers.

## **724.200 Surface Water Information**

### Water Quantity

The permit area exists within portions of the Dugout Creek, Soldier Creek, Pace Creek, and Rock Creek watersheds. The 600 acre expansion (addition of State Lease ML-50582-OBA and expansion of Federal Coal Lease U-07064-027821) will include in the permit area a small portion of the Cow Canyon watershed. Major tributaries of Soldier Creek whose watersheds extend into the permit area include Fish Creek and Pine Canyon. Based on observations and flow data obtained during the collection of water-quality samples within the permit and adjacent areas, portions of Dugout, Fish Creek, Pace Creek, and Cow Canyon are considered perennial within the permit area. Pine Canyon appears to be perennial in its upper reaches near the northern border of the permit area. Prior to 1999, Rock Creek appeared to be perennial in its upper reaches above the Castlegate Sandstone and only intermittent below the formation. Field observations from 2001 thru 2007 have shown the upper reaches to be functioning as intermittent by UDOGM

regulations, however the reaches below the formation have functioned as ephemeral. Several smaller tributaries of these streams within the permit and adjacent areas, are ephemeral.

Waddell et al. (1981) estimated that the average flow of Dugout Creek is approximately 7 cubic feet per second (5,100 acre-feet per year) and that up to 70 percent of the streamflow occurs during the period of May through July each year. The seasonal record of a stream gaging station which was installed on Dugout Creek during the period of October 1, 1979 through October 2, 1981 suggest that this estimate of the seasonal variation is correct (see Appendix 7-5). The location of this stream gaging station (DC-1) is noted on Plate 7-1.

During the 1980 water year, Waddell et al. (1986) estimated that the total flow of Dugout Creek at station DC-1 (referred by them as station S60) was 1,900 acre-feet. They further estimated that 53 percent of this flow (1,000 acre-feet) was contributed by springs issuing from the Flagstaff Formation, 10 percent (200 acre-feet) was contributed by springs issuing from the Blackhawk and other formations, and 37 percent (700 acre-feet) was contributed as surface runoff.

The average flow of Soldier Creek has been estimated by Waddell et al. (1981) to be approximately 8 cubic feet per second (5,800 acre-feet per year). This flow is expected to vary seasonally in a manner similar to that reported for Dugout Creek (i.e., the majority of the flow occurring during the late spring and early summer months in response to snowmelt runoff).

During the 1980 water year, Waddell et al. (1986) estimated that the total flow of Soldier Creek at station G-5 was 4,200 acre-feet. The source of this runoff was estimated to be as follows:

- 43 percent (1,800 acre-feet) from springs issuing from the Flagstaff Formation;
- 24 percent (1,000 acre-feet) from springs issuing from the Blackhawk and other formations; and
- 33 percent (1,400 acre-feet) as surface runoff.

Hence, the relative contribution of the Flagstaff Formation to streamflow in Soldier Creek is lower than that in Dugout Creek, while the contribution of the Blackhawk and other formations to Dugout Creek is lower than that to Soldier Creek.

Seasonal fluctuations in the discharge of streams in the area are readily apparent in the hydrographs of Solider Creek (Figure 7-8) and Dugout Creek (Figure 7-9). Locations of these stations are noted on Plate 7-1. As indicated, the discharge of local streams is greatest in the late spring and early summer months when influenced predominantly by snowmelt runoff.



Waddell et al. (1986) performed seepage measurements along Pine Canyon and Soldier Creek in the autumns of 1979 and 1980, in an effort to evaluate the effects of bedrock formations on the baseflow of the creeks. The seepage measurements demonstrated significant inflow to Pine Canyon occurs from the Flagstaff Formation near the contact with the underlying North Horn Formation. In Soldier Creek, the investigation found that 1) base flow more than tripled as Soldier Creek crossed the North Horn Formation, 2) base flow decreased about 20 to 30 percent as the creek crossed the Price River Formation and Castlegate Sandstone, and 3) base flow increased 10 to 25 percent as the creek crossed the Blackhawk Formation.

Figure 7-10 presents semilog plots of streamflow in Soldier Creek (station G-5) and Dugout Creek (station DC-1) for the latter portion of 1980, as reported by Waddell et al. (1986). Included in this figure are plots of discharge rates for springs issuing from the Flagstaff Formation and from the underlying Blackhawk Formation, Castlegate Sandstone, and Price River and North Horn Formations (Waddell et al., 1986). At Soldier Creek, the curves are approximately parallel for streamflow and the composite flows issuing from the Flagstaff Formation through August.

Thereafter, the recession curve for the streamflow flattens, while that for the Flagstaff Formation continues to decrease. Based on this condition, Waddell et al. (1986) concluded that the discharge of Soldier Creek is controlled predominantly by seepage from the Flagstaff Formation during the spring and early summer and by seepage from the underlying formations (Blackhawk, Castlegate, Price River, and North Horn) during the late summer and fall.

The data presented in Figure 7-10 indicate that discharge from the Flagstaff Formation dominates the flow of Dugout Creek throughout the year. Seepage from the underlying formations may slightly influence the flow of Dugout Creek during the autumn months, but this influence appears to be minimal. The lack of seepage from the Blackhawk and immediately-overlying formations to Dugout Creek supports the conclusion presented in Section 724.100 that the flow of groundwater within the permit and adjacent areas is to the north-northwest (i.e., away from Dugout Canyon).

Limited flow data is available from monitoring points within Pace Canyon and Rock Canyon Creeks. However, the data included in Appendix 7-7 suggests that flow within Pace Canyon Creek varies seasonally. Data collected at points PC-1A and PC-2 since June 1999, which are included in the Division's water database and in the updated spreadsheets found in Appendix 7-7, supports this determination. Flows in spring/early summer are typically several times greater than in late summer/fall. Also, it is interesting to note that in 2002 and 2003 there have been periods when there is no flow at station PC-2 and flows measured in late summer/fall at PC-1A have been significantly less than in previous years. The drop in flow is undoubtedly related to the prolonged

drought the area has been suffering through since 1999. Base flow within this drainage appears to originate from springs discharging from the ~~Castlegate Sandstone~~, Price River, Flagstaff/North Horn, and Colton Formations. The majority of the flow appears to originate from springs within the North Horn and Flagstaff Formations. A surface water monitoring point (Fan) has been added on Pace Creek at a location approximately 600 feet upstream from the top of the Pace Canyon Fan facilities disturbed area boundary. Surface flows measured at monitoring point Fan indicate that the stream is intermittent and likely fluctuates in flow volume seasonally.

Rock Canyon Creek base flow in its upper reaches appears to originate from springs discharging from the Northhorn Formation. Flow data from monitoring site RC-1 ~~near the mouth of Rock Canyon~~ indicates the lower sections of Rock Creek generally flow in response to spring runoff and after summer precipitation events. ~~Surface flows measured at monitoring point RC-1 near the mouth of Rock Canyon indicate that the stream is intermittent and also fluctuates in flow volume seasonally.~~ In 2002 and 2003, flow ~~was measured at RC-1~~ ~~occurred~~ only ~~flowed~~ after a significant precipitation event. Again, the lack of flow in this creek is most likely related to the drought conditions that appear to have begun in the area in 1999.

~~No stream samples have been collected from Cow Canyon since only a small portion of the watershed will be undermined and subjected to minimal subsidence. In fact, no perennial portions of Cow Canyon will be undermined or subsided. Springs within the canyon were included in the original baseline survey conducted in the mid-1990's and again in the summer of 2007. The field parameters were measured at the springs in Cow Canyon (Plate 7-2) and the results are included in Attachment 1 of the "Update to the Probable Hydrologic Consequence of Coal Mining at Dugout Canyon Mine, October 2007" in Appendix 7-3. Two new spring monitoring sites within the Cow Canyon drainage have been included in the water monitoring program to observe the effects, if any, of mining activities..~~

No streamflow data are available for ephemeral drainages in the permit and adjacent areas. When it does occur, ephemeral runoff in the area is expected to occur predominantly in the months of April and May in response to snowmelt runoff and in the months of August and September as a result of thunderstorm activity. Snowmelt may result in flow durations of a few weeks, while thunderstorms are expected to result in runoff with a short duration and high intensity.

Several small impoundments have been constructed in the permit and adjacent areas to capture water for stock watering. Those impoundments where water rights applications have been filed are located as shown on Plate 7-2. The impoundments capture water either from an adjacent spring or from snowmelt.

A UPDES permit application has been issued by the Utah Division of Water Quality as indicated in Appendix 7-6. This application applies to discharge from the sedimentation pond. Discharge from this point occurs only infrequently as a result of pond dewatering or after significant precipitation events. The application also applies to discharges from the underground mine workings.

Surface-water quality samples have been periodically collected in the permit and adjacent areas from stations located on Soldier Creek, Dugout Creek, Pine Canyon, Pace Creek, and Rock Canyon Creek (Plate 7-1). Analytical data from these sources are summarized in Appendix 7-7. These data were obtained from multiple sources, including (but not limited to) the Soldier Creek Coal Company M&RP and annual reports, U.S. Geological Survey publications, the Sage Point-Dugout Canyon permit application filed by Eureka Energy Company in 1980, Appendix 7-3 of this M&RP, and various consultant reports. Since not all monitoring parties were responsible to adhere to UDOGM or SMCRA rules, the laboratory parameters varied between reports. However, the data are still considered valid and appropriate for determining baseline conditions within the permit and adjacent areas. It should be noted that most of the manganese data presented in Appendix 7-3 represent total (as opposed to dissolved) concentrations.

In general, TDS concentrations of surface waters in the permit and adjacent areas vary inversely with the discharge rate. These concentrations also tend to increase in the downstream direction (Waddell et al., 1986). Total suspended solids concentrations in the local surface waters tend to vary directly with the flow rate (Waddell et al., 1986).

The data presented in Appendix 7-7 indicate that the dominant ions in surface water during high-flow periods are calcium and bicarbonate, whereas the dominant ions in the low-flow periods are sodium, magnesium, sulfate, and bicarbonate. During high-flow periods, runoff is rapid and most surface waters only interact chemically with the uppermost regions of the soil zone. Thus, they are dominated by calcium and bicarbonate ions. Furthermore, groundwater contributions from the Flagstaff Formation (where calcium and bicarbonate are the primary ions) dominate the chemical quality of surface water during high-flow periods (see Figure 7-10).

During low-flow periods, groundwater contributes a larger percentage of the flow in the stream (see Figure 7-10). With its higher TDS concentrations and different solute types (particularly in the Blackhawk Formation), the solute composition of the surface water is altered during low-flow periods.

Data presented in Appendix 7-5 indicate that the TDS concentration of water in Dugout Creek at station DC-1 has varied from about 350 to 500 mg/l with a pH of 8.0 to 8.5. Total suspended solids concentrations have varied from 5 to 1,000 mg/l during the period of record. .

Dissolved iron concentrations in Dugout Creek at station DC-1 have typically been less than 0.1 mg/l, while total iron concentrations are generally less than 1.0 mg/l. Dissolved manganese concentrations have typically been less than 0.01 mg/l, while total manganese concentrations are normally less than 0.1 mg/l. No seasonal variations in dissolved metals were noted. Total metals concentrations tend to vary directly with total suspended sediment concentrations.

It is important to note, the water chemistry data referenced was collected for Dugout Creek at DC-1 was obtained prior to the start of mine water discharge in 2002. Since mine water has been discharged, the TDS concentration in the water at DC-1 has varied between a minimum of 330 mg/L and maximum of 2160 mg/L and averages about 1000 mg/L. The pH has also varied in that time between a minimum of 7.3 and a maximum of 9.2 but typically is between 7.7 and 8.4. No appreciable increase in the total suspended solids concentration has been noted since the mine began discharging. Dissolved iron concentrations have risen slightly but average 0.11 mg/l. Total iron concentrations have also risen and average 0.74 mg/L. Dissolved manganese concentrations have risen but average 0.05 mg/L while total manganese concentrations average 0.06 mg/L. Additional discussions regarding the mine water discharge and participation in a total dissolved solids reduction project are included in the "Update to the Probable Hydrologic Consequences of Coal Mine at the Dugout Canyon Mine" in Appendix 7-3.

Historic data collected from Soldier Creek (Appendix 7-7) indicate that the total suspended solids concentration generally increases in the downstream direction and has varied from less than 10 to greater than 10,000 mg/l. Dissolved iron concentrations are typically less than 0.1 mg/l at stations G-1 and G-4, and less than 0.2 mg/l at G-5 (see Plate 7-1). The data do not indicate a seasonal variation in the concentration of dissolved iron. Total iron concentrations, which generally vary in accordance with the total suspended solids concentration, are typically less than 10 mg/l at all stations. Total manganese concentrations in Soldier Creek are generally less than 0.01 mg/l at G-1 and less than 0.10 mg/l at G-4 and G-5.

Data collected from Pine Canyon (Appendix 7-7) indicate that the total suspended solids concentration also tends to increase in the downstream direction and has varied from less than 10 to greater than 100 mg/l. Dissolved iron concentrations are typically less than 0.1 mg/l in Pine Canyon, with total iron concentrations typically being less than 1.0 mg/l. The data do not indicate a seasonal variation in the concentration of dissolved iron. However, total iron concentrations tend



to vary in accordance with the total suspended solids concentration. Total manganese concentrations in Pine Canyon are generally less than 0.01 mg/l at G-2 and less than 0.03 mg/l at G-3.

Data collected from Pace Creek (Appendix 7-7) indicate dissolved iron concentrations are typically less than 0.1 mg/l, with total iron concentrations typically being less than 1.0 mg/l. The limited data do not indicate a seasonal variation in the concentration of dissolved iron. Total manganese concentrations in Pace Creek are generally less than 0.01 mg/l.

#### **724.300 Geologic Information**

Geologic information related to the permit and adjacent areas is presented in Chapter 6 of this M&RP.

#### **724.400 Climatological Information**

Climatological data are summarized in Appendix 4-2 of this M&RP.

#### **724.500 Supplemental Information**

All information pertinent to a determination of the probable hydrologic consequences of the proposed Dugout Canyon Mine operation and reclamation are presented in this M&RP.

#### **724.600 Survey of Renewable Resource Lands**

The existence and recharge of groundwater systems in the permit and adjacent areas is discussed in Section 724.100 of this M&RP. A discussion of the potential for material damage or diminution of these groundwater systems and their recharge areas due to subsidence is provided in Section 728 of this M&RP.

#### **724.700 Alluvial Valley Floor Requirements**

Information regarding the presence or absence of alluvial valley floors in the permit and adjacent areas is presented in Chapter 9 of this M&RP.

## **725 Baseline Cumulative Impact Area Information**

The hydrologic and geologic information required for the Division to develop a Cumulative Hydrologic Impact Assessment is presented in this M&RP under Chapters 6 and 7. Required information not available in these chapters is available from the Utah Divisions of Water Rights and Water Resources and from the U.S. Geological Survey and the U.S. Bureau of Land Management.

## **726 Modeling**

No numerical groundwater or surface water modeling was conducted in support of this M&RP, other than that which has been published by others and referenced herein.

## **727 Alternative Water Source Information**

No surface mining will be conducted in the permit and adjacent areas. Therefore, this section does not apply to the Dugout Canyon Mine.

## **728 Probable Hydrologic Consequences**

This section addresses the probable hydrologic consequences of coal mining and reclamation operations in the mine permit and adjacent areas. Mitigating measures are discussed generally in this section and in detail in Section 730 of the M&RP.

### **728.100 Potential Impacts to Surface and Groundwater**

Potential impacts of coal mining on the quality and quantity of surface and groundwater flow may include:

- Contamination from acid- or toxic-forming materials;
- Increased sediment yield from disturbed areas;
- Increased total dissolved solids concentrations;
- Flooding or stream flow alteration;
- Impacts to groundwater or surface water availability;

- Hydrocarbon contamination from above ground storage tanks or from the use of hydrocarbons in the permit area;
- Contamination of surface and groundwater from road salting; and
- Contamination of surface water from coal spillage due to hauling operations.

These potential impacts are addressed in the following sections of this M&RP.

### **728.200 Baseline Hydrologic and Geologic Information**

Baseline geologic information is presented in Chapter 6 of this M&RP. Baseline hydrologic information is presented in Sections 724.100 and 724.200 of this M&RP.

### **728.300 PHC Determination**

**Potential Impacts to the Hydrologic Balance.** Potential impacts of the Dugout Canyon Mine on the hydrologic balance of the permit and adjacent areas are addressed in the following subsections of this M&RP.

**Acid- or Toxic- Forming Materials.** Information on acid-and toxic-forming materials is presented in Chapter 6. These data show that no acid- or toxic-forming materials are present at the Dugout Canyon Mine. Thus, no significant potential exists for the contamination of surface and groundwater in the permit and adjacent areas by acid- or toxic-forming materials.

**Sediment Yield.** The potential impact of mining and reclamation on sediment yield is an increase in sediment in the surface waters downstream from disturbed areas. Sediment-control measures (such as sedimentation ponds, diversions, etc.) will be installed to minimize this impact. These facilities will be regularly inspected (see Section 514) and maintained to ensure that they remain in proper operating condition.

Sediment yields may increase locally due to subsidence. Subsidence cracks which intersect stream channels with steep gradients could, for a short period of time, cause an increase in the sediment yield of the stream. However, this sediment increase would cause the crack to quickly fill, recreating pre-subsidence stream channel conditions. Thus, the potential impact to sediment yield from subsidence in the permit area would be minor and of short duration.



Various sediment-control measures will be implemented during reclamation as the vegetation becomes established. As discussed in Section 542.200 of this M&RP, these measures will include installation of silt fences and straw-bale dikes in appropriate locations to minimize potential contributions of sediment to Dugout Creek and Pace Creek. These measures will reduce the amount of erosion from the reclaimed areas, thereby precluding adverse impacts to the environment.

**Acidity, Total Suspended Solids, and Total Dissolved Solids.** Probable impacts of mining and reclamation operations on the acidity and total suspended solids concentrations of surface and groundwater in the permit and adjacent areas were addressed previously in this section.

Data presented in Appendix 7-2 and summarized in Section 724.100 of this M&RP indicate that the average TDS concentration of water in the Blackhawk Formation (as measured in inflow to the nearby Soldier Canyon Mine) is approximately 750 mg/l and is of the sodium-bicarbonate type. As noted in Section 724.200, the TDS concentration of water in Dugout Creek ranges from 350 to 500 mg/l ~~without mine discharge~~. The TDS concentration in Pace Creek ranges between 525 and 840 mg/l with an average TDS of about 620 mg/l. The dominant ions in these waters are calcium, magnesium and bicarbonate during high-flow periods, whereas the dominant ions during low-flow periods are sodium, magnesium, sulfate, and bicarbonate.

~~These data suggest that the TDS concentration of water in Dugout Creek and Pace Creek can be expected to increase if water is discharged from the mine to the Creek.~~ During periods of low streamflow, the dominant ions in the Blackhawk Formation water, Pace Creek and Dugout Creek should be similar. However, during periods of high streamflow, the dominant cation will be sodium in the Blackhawk water, magnesium in the Pace Creek water, and calcium in Dugout Creek. It should be noted that ~~it is anticipated that the Dugout Canyon Mine will use~~ powdered limestone or dolomite (i.e., calcium-magnesium-carbonate) for rock dust. It is not anticipated that gypsum rock dust (calcium-sulfate) will be used in the mine. Hence, dissolution of rock dust by water in the mine should not influence the chemical type of water in Dugout Creek or Pace Creek if mine water is discharged to the creek.

Typical iron and manganese concentrations in the Blackhawk Formation, Pace Creek and Dugout Creek (as summarized in previous sections) are:

	<u>Blackhawk Formation</u>	<u>Dugout Creek</u>	<u>Pace Creek</u>
Dissolved iron	<0.1 mg/l	<0.01 mg/l	<0.1 mg/l

Total iron	<0.5 mg/l	<1.0 mg/l	<1.0 mg/l
Dissolved manganese	--	<0.01 mg/l	--
Total manganese	<0.1 mg/l	<0.1 mg/l	<0.01 mg/l

~~These data indicate that the concentration of iron and manganese in Dugout Creek and Pace Creek should not be significantly affected by discharges from the mine.~~ As discussed previously in Section 724.200 discharge of mine water has increased the TDS, total and dissolved iron and dissolved manganese concentration in Dugout Creek below the mine site. Not enough data is yet available regarding the changes to the chemistry of Pace Creek water as a result of discharging mine water. However, the impacts are anticipated to be similar to those observed at Dugout Creek. The TDS concentration in Dugout Creek averages about 1000 mg/L since the mine started discharging. Dissolved and total iron average 0.11 mg/L and 0.74 mg/L respectively. Dissolved and total manganese average 0.05 mg/L and 0.06 mg/L respectively.

Dugout Creek and Pace Creek, as part of the lower Price River basin, is classified according to Section R317-2-13 of the Utah Administrative Code (Standards of Quality for Waters of the State) as a class 2B (secondary contact recreation use), 3C (nongame fish and other aquatic life use), and 4 (agricultural use) water. No TDS standards exist for class 2B and 3C water. The TDS standard for class 4 water is 1,200 mg/l.

It should also be noted that the dissolved iron standard for class 3C water is 1.0 mg/l. No dissolved iron standard exists for class 2B or 4 waters. The data presented above indicate that ~~potential~~ average discharge water from the mine ~~will~~ does not exceed the dissolved iron standard of Dugout Creek or Pace Creek. No standards exist in the R317 regulations for total iron, dissolved manganese, or total manganese. ~~However, the data presented above indicate that potential discharges from the mine to Dugout Creek and Pace Creek will meet the effluent limitations of 40 CFR 434.~~ The quality of the water discharged from the mine normally meets the limits set forth in its UPDES permit. Excursions from those limits occur when an upset condition exists within the mine. The upsets are typically related to power outages that allow the mine sections to flood followed by large volumes of water discharging from the mine.

One notable excursion from the UPDES limits occurred when mining in the Gilson seam on the east side of the Right Fork of Dugout Creek resulted in the operator draining the flooded old Knight Ideal Mine working in August 2002 and again in May 2003 to prevent catastrophic flooding of the current Dugout Canyon Mine operations. The old workings contained water with total iron in excess of 1 mg/l and this water was discharged to Dugout Creek at a rate that at times reached 1117 gpm. As a result of draining the old workings, the water discharged to Dugout Creek did have a

total iron concentration in excess of the UPDES permit limit of 1mg/l for a short period of time. It appears that water will be continuously drained from the Knight Ideal Mine for the foreseeable future to maintain safe underground working conditions but at a discharge rate expected to be much less than 100 gpm.

No hydrologic impacts have been noted at the adjacent Soldier Canyon Mine nor at the Dugout Canyon Mine due to subsidence. Although tension cracks may locally divert water into deeper formations, resulting in increased leaching of the formation and increased TDS concentrations, the potential of this occurring is considered minimal. This conclusion is based on experience at **both** the Soldier Canyon **and Dugout Canyon** Mine and on the fact that the shale content of the North Horn Formation, the Price River Formation, and the Blackhawk Formation should cause these subsidence cracks to heal quickly where they are saturated by groundwater flow. Thus, potential impacts on TDS concentrations would be minor and not of significant concern. To date (~~January 2004~~ **October 2007**), mining and subsidence within the Dugout permit area has not resulted in the loss of surface flows in the Dugout Creek drainage or impacts to ground water discharge rates at the monitored seeps and springs.

**Flooding or Streamflow Alteration.** Runoff from all disturbed areas will flow through a sedimentation pond or other sediment-control device prior to discharge to Dugout Creek or Pace Creek. Three factors indicate that these sediment-control devices will minimize or preclude flooding impacts to downstream areas as a result of mining operations:

1. The sedimentation pond and sediment traps have been designed and will be constructed to be geotechnically stable. Thus, the potential is minimized for breaches of the sedimentation pond to occur that could cause downstream flooding.
2. The flow routing that occurs through the sedimentation pond and other sediment-control devices reduces peak flows from the disturbed areas. This precludes flooding impacts to downstream areas.
3. By retaining sediment on site in the sediment-control devices, the bottom elevations of Dugout Creek and Pace Creek downstream from the disturbed area will not be artificially raised. Thus, the hydraulic capacity of the stream channel will not be altered.

The volume of streamflow ~~will~~**has** increased in Dugout Creek and Pace Creek ~~if~~**as** water is discharged from the mine to the creeks. Potential impacts to the creek channels could include the displacement of fines on the channel bottom, and minor widening of the channel. However, the degree of widening will likely be minimized by the increased vigor and quantity of vegetation which

will be sustained along the stream channel by the increased availability of water. In particular, it is anticipated that the deciduous streambank vegetative community (see Section 321.100) will increase in density and vigor as a result of mine-water discharges. This effect will occur for the distance downstream that surface flows can be sustained above channel transmission losses. Care will be taken during discharge of this water to avoid flooding of downstream areas. Once mining ceases, the mine will be sealed and no discharges will occur. The streamflow in Dugout Creek and Pace Creek will then return to pre-mining discharge levels.

Following reclamation, stream channels which have been altered by mining operations will be returned to a stable state (see Section 762.100). The reclamation channels have been designed to safely pass the peak flow resulting from the 10-year, 6-hour or the 100-year, 6-hour precipitation event as appropriate for the channel and in accordance with the R645 regulations (Appendix 7-11). Thus, flooding in the reclaimed areas will be minimized. Interim sediment-control measures and maintenance of the reclaimed areas during the post-mining period will preclude deposition of significant amounts of sediment in downstream channels following reclamation, thus maintaining the hydraulic capacity of the channels and precluding adverse, off-site flooding impacts.

Subsidence tension cracks that appear on the surface will increase the secondary porosity of the formations overlying the Dugout Canyon Mine. During the period prior to healing of these cracks, this increased percolation will decrease runoff during the high-flow season (when the water would have rapidly entered the stream channel rather than flowing into the groundwater system). During low-flow periods, the result of this increased percolation will be an increase in the base flow of the stream. Hence, the net result will be a decrease in the flooding potential of the affected stream.

Subsidence under the main fork of Dugout Creek will occur in areas where overburden ranges from 600 to 1200 feet thick. The area of the least amount of overburden, approximately 600 feet, occurs in the southern half of Section 14, Township 13 South Range 12 East. Additionally, subsidence on the right hand fork of Dugout Creek ~~will~~ may occur where overburden ranges from 500 feet to 2000 feet. The least amount of overburden on this fork of the creek occurs in the northeast quarter of Section 23, Township 13 South, Range 12 East. In both areas where the least amount of overburden occurs, the stream channels are lined with several feet of soils and fine grained sediments. Also, the upper Blackhawk Formation, which consists of interbedded shale, mudstone, siltstone, and sandstone, is exposed at the surface in a portion of these low overburden areas. The Castlegate Sandstone is present in the two low overburden areas but is rarely exposed in the channel floors.



To date, a short segment of the right hand fork has been undermined and subsided as the Gil 2 panel was mined in April 2005. The subsided area is located in the SW1/4 of Section 13 and the NW1/4 of Section 24, Township 13 South, Range 12 East. Monitoring of surface flows at DC-3 indicates no decrease in surface water flows in this channel.

The current mine plans include mining gate roads and entries under several sections of Pace Creek. However only limited subsidence will occur under Pace Creek in portions of Section 20, Township 13 South, Range 13 East where a longwall panel, Gil 5, has been is projected to be mined (Plate 5-7). The panel was mined between September 2006 and May 2007. To date, no impacts due to mining have been observed in the channel for in-stream flow. The stream channel in this area is lined with several feet of soils and fine grained sediments. Additionally, if Surface cracks do occur if they occurred in the sediments due to subsidence, it is likely any cracks will quickly filled with fine grained material and restricted the water from entering the fractures. The upper units of the Price River Formation which consists of sandstone, and the lower units of the North Horn Formation which consist of interbedded sandstone and mudstone, underlie the stream in this area. The overburden above the Gilson seam where subsidence will has occurred under Pace Creek will be is at least 1000 feet thick or more. As mining progresses to the east, the overburden becomes thicker due to changes in topographic elevation and the dip of the coal beds. Current mine plans do not include subsiding any perennial portion of Rock Canyon Creek.

A subsidence study performed at Burnout Canyon, a perennial stream drainage subsided by long wall mining at the Canyon Fuel Company, LLC Skyline Mines, suggests that thick fine grained soil mantles overlying bedrock appear to prevent noticeable stream flow losses to the bedrock (Rocky Mountain Research Station, 1998). Though the climatic regime and regional stratigraphy are not identical to the Burnout Canyon area, enough similarities exists to suggest that the bedrock, soils, and channel floors should react to subsidence in a similar fashion. As discussed in preceding sections, fractures related to subsidence within the fine grained sediments of the upper Blackhawk Formation in the Soldier Canyon Mine area tend to heal relatively rapidly. Also, fractures within the channel floor would be expected to fill quickly with fine grained sediments and become relatively impermeable. Therefore, the loss of stream flow to the mine is highly unlikely and losses to bedrock beneath the channel, or in the limited areas where bedrock is exposed in the channel floor, would be short lived.

**Groundwater and Surface Water Availability.** Potential impacts to the availability of surface and groundwater from the Dugout Canyon Mine operations include both decreased and increased stream flows and spring discharges caused by mine-related subsidence, bedrock fracturing, and aquifer dewatering. These potential impacts are discussed below.

### Potential for Decreased Spring and Stream Flows

To date, limited surface subsidence has been identified as a result of coal mining in ~~the nearby Soldier~~ the Dugout Canyon Mine. However, bedrock fracturing routinely occurs in the rock units overlying the mined coal seams. Given the limited number of springs and limited groundwater resources of the Blackhawk, Castlegate, and Price River Formations in the permit and adjacent areas, subsidence or fracturing would affect the hydrologic balance in the area only if zones of increased vertical hydraulic conductivity were created which extended through the Price River Formation into the North Horn and Flagstaff Formations.

Several lines of evidence suggest that mining-related subsidence and bedrock fracturing have not resulted in decreased stream flows or groundwater discharge in the vicinity of the Dugout Canyon Mine. While to-date no monitored discharging springs have been undermined at Dugout Creek, several springs in the upper tributaries of Fish Creek were undermined in 2001 - 2003. These springs are numbered SC-15, SC-16, SC-17, and SC-18. These springs were originally identified as flowing springs in the 1980s. Subsequent visits to these sites in the fall of 1995 and summer of 2006 did not observe flows from these spring locations. It has been speculated these springs were originally identified after a significant wet cycle and the spring locations appear to represent re-emergence of flow from spring SC-14. ~~nearby Soldier Canyon Mine. For instance, although spring SP-10 is likely the result of the upwelling of deep groundwater, it is significant to note that the spring discharge rate has not been affected by mining operations, even though mining has cut through the fracture zone at depths. Furthermore, although considerable seasonal and climatic variability are noted in the hydrographs of springs in the permit and adjacent areas, data for both Soldier Creek and springs which overlie the Soldier Canyon Mine workings do not show discharge declines which may be attributed to either subsidence or bedrock fracturing (see Appendix 7-3).~~

~~As of December 2003, none of the spring monitoring sites had been undermined and subsided at Dugout Canyon Mine. Therefore, impacts to springs due to subsidence at this mine cannot be fully studied at this time but should have similar effects to ground water as mining at the Soldier Canyon Mine. Ephemeral portions of Fish Creek and Dugout Creek drainages have been subsided and no significant adverse effects to those drainages have been noted to Dugout Creek.~~

Active groundwater systems in the Flagstaff and North Horn Formations are separated from the Blackhawk groundwater system by the Price River Formation. As discussed in Section 724.100, this formation contains very few springs and is not considered to be a major groundwater resource. Past mining in the Soldier Canyon Mine has not increased the rate of spring discharge from the Price River Formation, indicating that groundwater is not being diverted into this formation. The absence of increased saturation in the Price River Formation due to coal mining indicates that

vertical zones of artificially-increased hydraulic conductivity do not extend into the Price River Formation and from thence into the active groundwater systems of the North Horn and Flagstaff Formations.

Data presented in Appendix 7-3 and summarized in Section 724.100 indicate that the Blackhawk groundwater system, in the vicinity of mined coal seams, contains ancient groundwater which is compartmentalized both vertically and horizontally. Coal mining locally dewateres overlying rock layers in the Blackhawk Formation but does not appear to draw additional recharge from overlying or underlying groundwater systems (see Appendix 7-3).

The strong vertical gradients in Blackhawk Formation rock layers underlying actively mined coal seams in the Soldier Canyon Mine and the absence of significant discharge into the mine from these layers indicates that mining does not draw groundwater from the underlying Mancos Shale. Additionally, the distinctive solute composition of Mancos Shale groundwater has not been observed inside the Soldier Canyon Mine (see Appendix 7-3).

Ground water has discharged to the Dugout Canyon Mine through fractures in the floor of the mine. Initial water chemistry of the mine water does not indicate this water is sourced from the underlying Mancos Shale. It is much more likely the fractures are draining isolated aquifers beneath the coal but hydraulically connected by the fractures. Flows from these fractures typically have steadily decreased after initially being encountered during mining.

From the above discussion, it appears that the Soldier Canyon Mine has not decreased groundwater discharge in overlying or underlying groundwater systems. Additionally, monitoring in the Dugout Canyon Mine area indicates mining within that area has not decreased groundwater discharge in overlying or underlying ground water systems. Hence, it is unlikely that coal mining will effect the discharges of any spring as a result of mining in the Dugout Canyon permit and adjacent areas.

#### Potential for Increased Stream Flows

If sufficient water is has been encountered in the Dugout Canyon Mine workings to require requiring the mine to discharge of that water to the surface, the flow of Dugout Creek and Pace Creek. will be increased. Originally, to estimate the To estimate the potential quantity of inflow to the Dugout Canyon Mine, the an investigation of Lines (1985) was reviewed. In this investigation, Lines (1985) evaluated groundwater conditions in the Trail Mountain Area, located in the hydrogeologically-similar Wasatch Plateau approximately 23 miles southwest of the proposed



Dugout Canyon Mine permit area. Using a finite-difference model, Lines (1985) evaluated potential inflows into a hypothetical coal mine in the Blackhawk Formation. Initially, this model was used by the mine to predict the potential mine inflows. The results of this model indicated the flows would equal about 214 gpm. Mayo and Associates, while preparing the PHC for this mine, predicted a potential inflow of about 800 gpm of inflow. This calculation was based on the ground water inflow rates observed in the Soldier Canyon Mine and related to the rate of coal production. Mayo's calculations led him to believe that if approximately one million tons of coal are mine per year in the Dugout Mine, then the mine could expect an inflow rate of approximately 800 gpm. Dugout Mine typically mines three to four million tons of coal per year. Ground water production from the Dugout Mine has ranged from 0 gpm during the first four years of production to as high as 2800 gpm under emergency conditions. The average current rate of ground water production from the mine appears to be about 1900 gpm. This rate appears to be closer to that which Mayo predicted. It is anticipated that as mining continues down dip for the next several years, mine inflow rates may increase. This is based on the assumption that channel sandstones in the roof and floor will contain proportionately larger volumes of water as the distance from outcrop is increased. Also, as the panels are mined in the area between Rock and Pace Canyons and updip of current workings, it is likely the volume of ground water flowing into the mine will decrease. ~~assuming hydraulic conductivities of 0.01 ft/day for the Blackhawk Formation and 0.02 ft/day for the Star Point Sandstone. He further assumed hydraulic gradients which varied from 0.041 ft/ft to 0.098 ft/ft. Results of these evaluations are presented in Figure 7-11.~~

~~As noted in Section 724.100, the median hydraulic conductivity of the Blackhawk Formation in the vicinity of the permit area is  $5.1 \times 10^{-4}$  ft/day, a factor of 20 lower than the values assumed by Lines (1985). As also noted in Section 724.100, the average hydraulic gradient of the Blackhawk Formation is 0.008 ft/ft, a factor of 5 lower than the lowest values assumed by Lines (1985). Since an increase in the hydraulic conductivity and the hydraulic gradient would tend to increase the inflow to the mine, using the evaluation of Lines (1985) should result in an overestimate of potential inflows to the Dugout Canyon Mine.~~

~~According to Plate 5-7 of this M&RP, the planned area of mining west of the proposed North Mains within the Rock Canyon seam will have a length of approximately 10,000 feet and an average width of about 3,000 feet. The planned area of mining within the Gilson seam west of the North Mains will have an average length of 6,000 feet and an average width of 3,000 feet. Similarly, the mine area within the Gilson seam in the vicinity of the Southeast Mains can be divided into two sections; one section having an approximate length of 10,000 feet and an approximate width of 4,000 feet and the other having an average length of 8,500 feet and an average width of 2,000 feet.~~

~~Using the above data and Figure 7-11, these mine "segments" can be expected to have steady-state inflows as follows:~~

- ~~Rock Canyon seam 10,000-foot long and 3,000-foot wide mine segment can have a steady-state inflow of approximately 0.13 cfs (58 gpm);~~
- ~~Gilson seam (west) 6,000-foot long and 3,000-foot wide mine segment can have a steady-state inflow of approximately 0.09 cfs (40 gpm);~~
  - ~~Gilson seam (east) 10,000-foot long and 4,000-foot wide mine segment can have a steady-state inflow of approximately 0.15 cfs (67 gpm), and~~
- ~~Gilson seam (east) 8,500-foot long and 2,000-foot wide mine segment can have a steady-state inflow of approximately 0.11 cfs (49 gpm).~~

~~Totaling the one mine segment within the Rock Canyon seam and the three segments within the Gilson seam, the mine could be expected to produce approximately 214 gpm.~~

~~It should be re-emphasized that this estimate is considered to be conservatively high. Not only do site conditions indicate lower hydraulic conductivities and lower hydraulic gradients, but each section of the mine is being treated in the above analysis as though it was hydraulically isolated. Since there would be significant overlap between the cones of depression created by each section, the inflow to the mine would be further reduced below that estimated above.~~

~~The amount of water which will be discharged from the mine will equal the inflow minus that which is consumed in the mining operation (dust suppression and evaporation). Based on experience at the Soldier Canyon Mine, the rate of water to be consumed in the Dugout Canyon Mine is estimated to be 15,000,000 gallons per year (approximately 30 gpm). The remaining 190 gpm (306 acre-feet per year) is the maximum estimated discharge to Dugout Creek. This represents an increase of 6 percent in the estimated average annual flow of Dugout Creek of 5,100 acre-feet (see Section 724.200).~~

~~Section 3.1.2.1 of Appendix 7-3 estimates that the maximum discharge from both the Dugout Canyon Mine and a potential mine in the Alkali Creek tract located west of the Soldier Canyon Mine will be 800 gpm. This estimate is based on the assumption that "groundwater discharge rates into mined areas are approximately proportional to mining rates." No specific data are presented in Appendix 7-3 in support of this assumption.~~

~~Appendix 7-3 predicts that approximately 400 gpm of the 800 gpm estimated maximum discharge can be attributed to the Alkali Creek tract, leaving an estimated maximum discharge from the Dugout Canyon Mine of 400 gpm. If this maximum rate of 400 gpm could be sustained for a period of one year, this would represent an increase of 13 percent in the estimated average annual flow of Dugout Creek of 5,100 acre-feet (see Section 724.200). Hence, discharges from the Dugout Canyon Mine may result in increases in the flow of Dugout Creek of 6 percent (under steady-state conditions) to 13 percent (under maximum transient conditions).~~

**Potential Hydrocarbon Contamination.** Diesel fuel, oils, greases, and other hydrocarbon products will be stored and used at the site for a variety of purposes. Diesel and oil stored in above-ground tanks at the mine surface facilities may spill onto the ground during filling of the storage tank, leakage of the storage tank, or filling of vehicle tanks. Similarly, greases and other oils may be spilled during use in surface and underground operations.

The probable future extent of the contamination caused by diesel and oil spillage is expected to be small for three reasons. First, because the tanks will be located above ground, leakage from the tanks will be readily detected and repaired. Second, spillage during filling of the storage or vehicle tanks will be minimized to avoid loss of an economically valuable product.

Finally, the Spill Prevention Control and Countermeasure Plan which will be developed for the site will provide inspection, training, and operation measures to minimize the extent of contamination resulting from the use of hydrocarbons at the site. This plan is not required to be submitted. However, a copy will be maintained at the mine site as required by the Utah Division of Water Quality.

**Road Salting.** When necessary for safety purposes, salt and/or ice melting compounds will be used on paved road areas. The paved road areas report to the sediment pond for treatment.

**Coal Haulage.** Coal will be hauled over the county road from the mine portal area to the Soldier Creek Road and thence to its ultimate destination. In the event of an accident which causes coal to spill from the trucks, residual coal following cleanup of the spill may wash into local streams during a runoff event. Possible impacts to the surface water are increased total suspended solids concentrations and turbidity from the fine coal particulates. The probability of a spill occurring in an area sufficiently close to a stream channel to introduce coal to the stream bed is considered small.

In addition to spills, wind may carry coal dust or small pieces of coal from the open top of the coal trucks into creeks near the roads. The impact from fugitive coal dust is considered to be insignificant due to the small amounts lost during haulage in the permit and adjacent areas.

**Water Replacement.** The water consumed in operating underground equipment, dust suppression, and evaporation is obtained from ground water sources. These underground water sources are not connected to the surface waters in the area. Research has been performed by the mine to verify that water currently entering the mine is not coming from the surface or depleting surface waters. Continued monitoring by the mine of the surface waters and seeps and springs flows in the permit and adjacent areas have shown no discernable impacts due to mining activities. It is the operator's position that the water consumed in operating Dugout Canyon Mine is not depleting surface water sources. In fact, there is an overall net gain to local river systems discharging to the Colorado River as a result of the mine's discharge.

The Permittee will replace the water supply of any land owner if such a water supply proves to be contaminated, diminished or interrupted as a result of the mining operations. First, a determination will be made by the Division in accordance with R645 - 301- 731.800 as to whether or not material damage has occurred. Then, in accordance with Regulation R645-301-525.510, Dugout Canyon Mine will correct any material damage resulting from subsidence caused to surface lands (which includes water rights), to the extent technologically and economically feasible, by restoring the land to a condition capable of maintaining the value and reasonably foreseeable uses that it was capable of supporting before subsidence damage. Negotiations will be held with the water right holders to determine the best plan of action and implementation of water replacement.

### **729 Cumulative Hydrologic Impact Assessment (CHIA)**

A Cumulative Hydrologic Impact Assessment to include the permit and adjacent areas is to be prepared by the Division.

## **730 OPERATION PLAN**

### **731 General Requirements**

This permit application includes an operation plan which addresses the following:

- Groundwater and Surface Water Protection and Monitoring Plan;
- Design Criteria and Plans;



- Performance Standards; and
- Reclamation Plan.

### 731.100 Hydrologic-Balance Protection

**Groundwater Protection.** To protect the hydrologic balance, coal mining and reclamation operations will be conducted to handle earth materials and runoff in a manner that minimizes acidic, toxic, or other harmful infiltration to the groundwater system. Additionally, the permittee will manage excavations and disturbances to prevent or control discharges of pollutants to the groundwater.

~~As indicated in Section 728.300, it is anticipated that an average of approximately 190 gallons per minute of groundwater encountered in the mine will eventually be discharged to Dugout Creek or Pace Creek. This Water will be discharged from the mine in a controlled manner, in accordance with an approved UPDES permit, via a pipeline from the mine to the creek. The Dugout Creek discharge point is anticipated to be located at the upstream inlet to the Dugout Canyon culvert, UC-6. If the discharge occurs to a point outside of the culvert, Riprap will be~~ has been placed at the outlet of the pipe to prevent erosion. The Pace Creek discharge point ~~will be~~ is located southeast of the fan shaft. The pipe ~~will discharge~~ directly to the creek. The pipe outlet ~~will be~~ is riprapped to prevent erosion. Any erosion that occurs at the points of discharge will be repaired as soon as practical.

**Surface Water Protection.** To protect the hydrologic balance, coal mining and reclamation operations will be conducted to handle earth materials and runoff in a manner that minimizes acidic or toxic drainage, prevents, to the extent possible, additional contributions of suspended solids to streamflow outside the permit area, and otherwise prevents water pollution. Additionally, ~~SCM the~~ mine will maintain adequate runoff- and sediment-control facilities to protect local surface waters.

During initial construction to develop the surface facilities, and prior to installation of all runoff- and sediment-control facilities as outlined in Section 732 of this M&RP, silt fences will be installed along the top bank of Dugout Creek and its eastern tributary in areas prior to disturbance. These silt fences will be installed in accordance with Figure 5-4. If required for control of local erosion, straw-bale dikes may also be installed at the site during initial construction. These dikes will also be installed in accordance with Figure 5-4. The silt fences and straw-bale dikes will be periodically inspected, and accumulated sediment will be removed as needed to maintain functionality. Once the sedimentation pond, ditches, and culverts are installed, the silt fences and straw-bale dikes may be removed.

During initial construction to develop the surface facilities in Pace Canyon, and prior to installation of all runoff- and sediment-control facilities as outlined in Appendix 7-12 of this M&RP, silt fences will be installed along the disturbed area boundary and along the tributary drainages upstream and downstream of the surface facilities. These silt fences will be installed in accordance with Figure 5-4. If required for control of local erosion, straw-bale dikes may also be installed at the site during initial construction. These dikes will also be installed in accordance with Figure 5-4. The silt fences and straw-bale dikes will be periodically inspected, and accumulated sediment will be removed as needed to maintain functionality. Once the sedimentation trap, ditches, and culverts are installed, the interim silt fences and straw-bale dikes will be removed.

Once the runoff- and sediment-control facilities outlined in Section 732 have been installed, these structures will prevent additional contributions of suspended solids to streamflow outside the permit area. A description of sediment control following reclamation is presented in Sections 540 and 760 of this M&RP.

#### **731.200 Water Monitoring**

**Groundwater Monitoring.** Groundwater monitoring to be conducted in the permit and adjacent areas will consist of data collection from monitoring wells, springs, and mine-water discharges. Locations of wells and springs to be monitored are noted on Plate 7-1. The groundwater monitoring plans presented herein were developed based on information presented in the PHC determination, the baseline hydrologic data, and the geologic data presented in Chapter 6 of this M&RP, and operational changes at the mine.

Monitoring wells included in the groundwater monitoring program are GW-10-2, GW-11-2, and GW-24-1. The remaining monitoring wells in the general vicinity are either too remote from the permit area to be indicative of impacts occurring from the Dugout Canyon operations (i.e., GW-5-1, GW-6-1, GW-32-1, and G-58.5) or are completed across multiple aquifers (i.e., GW-19-1), making data interpretation difficult.

The monitoring wells are completed in the Price River Formation or the underlying Castlegate Sandstone. Because the Castlegate Sandstone immediately overlies the Blackhawk Formation, data collected from these wells allow hydrologic impacts of mining to be evaluated in groundwater systems which overlie the mine workings but underlie the Flagstaff and North Horn groundwater systems.

Water-level measurements will be collected on a quarterly basis when the wells are accessible. Given the ages of the wells and the probable deterioration of the casing materials, no attempts will be made to collect water-quality data from the monitoring wells.

The springs to be included in the operational and post-mining groundwater monitoring program are:

<u>Spring</u>	<u>Formation</u>
SC-65	Colton
SP-20	Flagstaff
SC-14	North Horn
SC-100	Flagstaff (at North Horn FM. Contact)
SC-116	North Horn
200	North Horn
203	North Horn
227	Castlegate Sandstone
259	North Horn
260	Colton
259A	Colton
321	Colton
322	Colton

Locations of these springs are noted on Plate 7-1.

The purpose of monitoring the above-listed springs will be to assess potential impacts to groundwater systems overlying the Blackhawk Formation due to subsidence and mine dewatering. Springs have been selected for monitoring in the Colton, Flagstaff, North Horn, and Castlegate Sandstone Formations. These springs are reasonably accessible and, based on the historical data, are representative of conditions within their respective formations.

It should be noted that reliable data have been difficult to collect from the limited number of springs issuing from the Blackhawk Formation within the permit and adjacent areas. As a result, no springs issuing from this formation have been included in the long-term monitoring program.

The ground water monitoring and sampling protocols to be implemented are described in Table 7-4. These protocols are based on the probable hydrologic consequences (PHC) of mining as presented in Section 728 and Appendix 7-3 of this M&RP and the requirements put forth in the Division's regulations. Table 7-4 is the same as that presented in Coal Regulatory Program Directive Tech-004, with the exception that total hardness and total alkalinity are not included.



Total hardness, which is primarily of concern in water supplies being developed for domestic use, was not added to the list because summer-home development of the permit area is not an identified post-mining land use. Total alkalinity was not added to the list because the baseline data indicate that acid-generating materials, which may affect the alkalinity of the water, are not present within the permit and adjacent areas.

The protocols set forth in Table 7-4 will be followed during years of normal precipitation as defined in the PHC. Wet or dry (not normal) years for the mine area are defined based on the Natural Resources Conservation Services snow-pack measurements as of March 1 for the Price River-San Rafael River Basin. A wet year occurs when the snow pack water content is greater than 110% of normal and a dry year when the snow pack is less than 70% of normal. After the permit is issued, the following monitoring protocol will be implemented for the first wet or dry year occurrence:

1. Weekly measurements of flow during the first wet year and the first dry year following permit issuance will be obtained. The purpose of these measurements will be to prepare base-flow hydrographs of the monitored springs. Flow measurements during the first wet year and the first dry year will be collected weekly between April 1 and August 31 as conditions permit.
2. Water samples will be obtained during high- and low-flow season in conjunction with the quarterly sampling, if applicable. The samples will be analyzed in accordance with Table 7-4 with the addition of tritium analysis.

In addition to the above regular monitoring, one water sample will be collected at each spring sampling point during low flow period every fifth year, during the year preceding re-permitting, to be analyzed for baseline parameters (Table 7-4).

Groundwater was discovered discharging from old Gilson coal seam workings located on the east side of Dugout Canyon during construction of the Dugout Canyon Mine in September 1998. Prior to construction, this water seeped unnoticed through unconsolidated fill and into Dugout Creek. The water discharging from these old workings will be monitored on a quarterly basis for the parameters listed in Table 7-4 beginning in the fourth quarter of 1998. The monitoring point is labeled MD-1 on Plate 7-1.

Data will be collected from the Dugout Canyon Mine and Pace Canyon Fan Portal mine-water discharge point in accordance with the UPDES permits. No water will be discharged prior to

obtaining the necessary UPDES permits. The monitoring requirements proposed herein, including the analytical parameters and the sampling frequency, may be modified in the future in consultation with the Division if the data demonstrate that such a modification is justified.

Data will be collected under the groundwater monitoring program every year following the completion of surface reclamation activities. During the post-mining period, water levels will be collected from the monitoring wells and data/samples will be collected from the identified springs once each year during September or October (i.e., the low-flow season while the sites are still accessible). Groundwater monitoring during the post-mining period will continue until bond release.

All groundwater monitoring data will be submitted to the Division by the end of the quarter following sampling. If analyses of any groundwater sample indicates noncompliance with the permit conditions, the permittee will promptly notify the Division and take immediate appropriate actions. UPDES reporting requirements will be met for the mine-water discharge points. The Snotel data used to determine "wet" or "dry" years, as described previously in this section, will be submitted with the first quarter water monitoring data beginning in the year 2001 or in the annual report.

Equipment, structures and other devices used in conjunction with monitoring the quality and quantity of groundwater in the permit and adjacent areas have been or will be installed, maintained, and operated in accordance with accepted procedures. Where feasible, this equipment will be removed or properly abandoned by the permittee when no longer needed.

**Surface Water Monitoring.** Surface water monitoring to be conducted in the permit and adjacent areas will consist of data collection from streams and sedimentation pond discharges. Locations of streams to be monitored are noted on Plate 7-1. The surface water monitoring plans presented herein were developed based on information presented in the PHC determination, the baseline hydrologic data, and the geologic data presented in Chapter 6 of this M&RP.

Station DC-1 will be monitored to evaluate surface-water conditions downstream from the proposed surface facilities. Stations DC-2 and DC-3 will provide data concerning background surface-water conditions immediately upstream from the proposed surface facilities. Stations DC-4 and DC-5 will be located at the Castlegate Sandstone-Blackhawk Formation contact and will provide data that will be used to determine the relationship between the Blackhawk Formation and the base flow of Dugout Creek.

PC-1a and PC-2 are located on Pace Creek and will be monitored to evaluate surface-water conditions up gradient and down gradient, respectively, of the permit area. Monitoring point (Fan)

has been added on Pace Creek at a location approximately 600 feet upstream from the top of the Pace Canyon Fan facilities disturbed area boundary. Monitoring locations Fan and PC-2 will be monitored to evaluate surface water conditions up gradient and down gradient, respectively, of the Pace Canyon Fan facilities. RC-1 has also been established as monitoring point to obtain baseline data for future mine expansion. Baseline data ~~will be~~ was obtained from the aforementioned three sites (PC-1a, PC-2 and RC-1) for three years prior to initiating operational sampling.

PC-3 is located on Pace Creek below the confluence of an unnamed ephemeral drainage with Pace Creek (Plate 7-1). Degas Wells G-18, G-19 and the AMV road are located adjacent to the unnamed drainage at various elevations. Surface water monitoring location PC-3 was added during the permitting of the AMV road and Degas Wells G-18 and G-31, baseline data was not gathered for this monitoring location. The operational monitoring of PC-3 will begin the 4<sup>th</sup> quarter of 2007.

Protocols for surface-water monitoring within the permit and adjacent areas are:

- DC-1, FAN, PC-3 - Quarterly data collection in accordance with Table 7-5 (operational parameters). This table is the same as that presented in Coal Regulatory Program Directive Tech-004, with the exception that total hardness and total alkalinity are not included. As explained above, total hardness, which is primarily of concern in water supplies being developed for domestic use, was not added to the list because summer-home development of the permit area is not an identified post-mining land use. Total alkalinity was not added to the list because the baseline data indicate that acid-generating materials, which may affect the alkalinity of the water, are not present within the permit and adjacent areas.
- DC-2, DC-3, PC-1a, PC-2, and RC-1 - Quarterly data collection in accordance with Table 7-5. Collection of gain-loss hydrograph data during the first wet year and the first dry year following permit issuance. Wet and dry years will be defined as noted in the previous groundwater monitoring discussion. The hydrograph will be generated by collecting flow measurements during the first wet year and the first dry year on a weekly basis between April 1 and August 31 as conditions permit.
- DC-4 and DC-5 - Collection of gain-loss hydrograph data during the first wet year and the first dry year following permit issuance, as described above. Collect flow measurements during the first wet year and the first dry year on a weekly basis between April 1 and August 31 as conditions permit. Samples will also be collected for laboratory analyses during the

first wet year and the first dry year following permit issuance. Wet and dry years will be defined as noted above. These samples will be collected during the high-flow and low-flow seasons. The samples will be analyzed for tritium and the operational parameters contained in Table 7-5.

In addition to the above regular monitoring, one water sample will be collected at each sampling point during low flow period every fifth year, during the year preceding re-permitting, to be analyzed for baseline parameters (Table 7-5).

The monitoring requirements proposed herein, including the analytical parameters and the sampling frequency, may be modified in the future in consultation with the Division if the data demonstrate that such a modification is justified. Data will be collected from the sedimentation pond discharge point in accordance with the UPDES permit. Data will be collected under the surface water monitoring program every year until bond release.

All surface water monitoring data will be submitted to the Division by the end of the quarter following sampling. If analyses of any surface water sample indicates noncompliance with the permit conditions, SCM will promptly notify the Division and take immediate appropriate actions. UPDES reporting requirements will be met for the sedimentation pond discharge point.

Equipment, structures and other devices used in conjunction with monitoring the quality and quantity of surface water in the permit and adjacent areas have been or will be installed, maintained, and operated in accordance with accepted procedures. Where feasible, this equipment will be removed or properly abandoned by SCM when no longer needed.

#### Monitoring and Mitigation Plan Pace Creek

Dugout Canyon Mine plans to leave a barrier under the majority of Pace Creek within the permit boundary. The stretches of Pace Creek (10/04 mine map) which are planned for undermining are above entry development, not longwall panels. There is approximately 1000 feet of stream channel having over 500 feet of cover planned for mining in 2007, 400 feet has approximately 900 feet of cover planned for mining in 2008 and approximately 100 feet has 1250 feet of cover planned for mining in 2008-2009. A surface water monitoring and mitigation program will be initiated in this area prior to potential subsidence occurring. This monitoring program will include conducting a pre-mining subsidence photographic survey of the stream channel from surface water monitoring location PC1A to where Pace Creek leaves the SW1/4SW14 Section 20, T13S, R13E and a single

reference site below the Pace Canyon fan site. The purpose of the photographs will be to provide a visual record of the stream channel prior to mining disturbance. Five reference sites will be identified within the photographed portion of Pace Creek where the monitoring of surface ground water flows, channel width and general geomorphology will occur. These reference sites will be established during low flow in the creek and monitored as outlined by the USDA Forest Service (Stream Channel Reference Sites: An Illustrated Guide to Field Technique. General Technical Report RM-245, Harrelson et. Al., 1994). The photographing of Pace Creek and the selection of monitoring sites will be done no later than the Spring of 2006 and submitted as part of the 2006 annual report.

The surface water flows and channel width at these stations will be monitored on a monthly basis, when accessible, while mining is occurring within the 15 degree angle-of-draw of the stream channel. The Division will be notified if the area is inaccessible due to road or climatic conditions and the monitoring could not be accomplished. Once mining has been completed within the angle-of draw, the sites will be monitored annually for up two years following undermining. A report on the subsidence related impacts, if any, to the surface water flows, will be provided monthly to the Division during monthly monitoring and annually during annual monitoring.

Mitigation will implement the Best Technology Currently Available in association with the repair of damage to the Pace Creek stream channel. The repairs may include the use of bentonite/soil mixes to fill persistent cracks that appear to be diverting water. Bentonite may also be used to line portions of the creek floor where leakage appears to be occurring. Other methods or chemicals, if environmentally safe and available, may be employed if bentonite and/or bentonite/soil mixes are ineffectual.

#### **731.300 Acid- and Toxic-Forming Materials**

Analyses presented in Chapter 6 of this M&RP indicate that acid- and toxic-forming materials are not present within the permit area. Parameters defining acid- and toxic-forming materials will periodically be monitored as described in Chapter 6 of this M&RP. In the event that acid- or toxic-forming materials are identified, they will be disposed of in appropriate waste-rock disposal facilities as described in Chapter 5 of this M&RP.

#### **731.400 Transfer of Wells**

Before final release of bond, exploration or monitoring wells will be sealed in a safe and environmentally sound manner in accordance with R645-301-631, R645-301-738, and R645-



**TABLE 7-4**  
**Groundwater Monitoring Program**  
Field and Laboratory Measurement Protocol

<u>Monitoring Wells</u>	<u>Protocol</u>	<u>Comments</u>
GW-10-2	A, 1	Screened in Castlegate Sandstone
GW-11-2	A, 1	Screened in Price River Formation
GW-24-1	A, 1	Screened in Castlegate Sandstone
<u>Springs</u>		
SP-20 (S-30)	B, 2, 5	Flagstaff
SC-14	B, 2, 5	North Horn
SC-65	B, 2, 5	Colton
SC-100	B, 2, 5	Flagstaff (at North Horn FM. Contact)
SC-116	B, 3, 5	North Horn
200	B, 3, 5	North Horn
203	B, 3, 5	North Horn
227	B, 3, 5	Castlegate Sandstone
259	B, 3, 5	North Horn
259A	B	Colton
260	B, 3, 5	Colton
MD-1	C, 4	Gilson Seam Workings Discharge
321	B,6	Colton
322	B,6	Colton

Protocols

- A Monitoring well: quarterly water level measurement only
- B Spring: quarterly flow measurements
- C Mine Water Discharge, abandoned Gilson Seam workings: quarterly flow measurements

Water quality

- 1 Monitoring well: No quality measurements.
- 2 Spring: quarterly operational groundwater quality parameters for two years beginning 3<sup>rd</sup> quarter 1999 after which quarterly field measurements only.
- 3 Spring: quarterly baseline parameters for three years beginning 1<sup>st</sup> quarter 1999 after which quarterly field measurements only.
- 4 Mine water discharge: quarterly operational water quality parameters.
- 5 During wet or dry years (as described in the PHC, Appendix 7-3), flows will be taken weekly between April 1 and August 31 as conditions permit. Also during the first wet or dry year, one operational laboratory sample and one Tritium sample will be obtained at these sites during high and low flow season.
- 6 Spring: quarterly operational groundwater quality parameters for two years beginning 3<sup>rd</sup> quarter 2007 after which field measurements only.

**Groundwater Quality Parameters**

FIELD MEASUREMENTS

Water Level or Flow  
pH  
Specific Conductivity  
Temperature

REPORTED AS

Feet or gpm or cfs  
pH units  
 $\mu\text{s/cm}$  @ 25°C  
°C

**TABLE 7-4 (continued)**  
**Groundwater Monitoring Program**

Laboratory Parameters	Reported As	Operational Monitoring	Baseline Monitoring
Acidity	mg/l		X
Aluminum (Dissolved)	mg/l		X
Ammonia	mg/l		X
Arsenic (Dissolved)	mg/l		X
Boron (Dissolved)	mg/l		X
Bicarbonate	mg/l	X	X
Carbonate	mg/l	X	X
Calcium (Dissolved)	mg/l	X	X
Chloride	mg/l	X	X
Cadmium (Dissolved)	mg/l		X
Copper (Dissolved)	mg/l		X
Iron (Dissolved)	mg/l	X	X
Iron (Total)	mg/l	X	X
Lead (Dissolved)	mg/l		X
Magnesium (Dissolved)	mg/l	X	X
Manganese (Dissolved)	mg/l	X	X
Manganese (Total)	mg/l	X	X
Molybdenum (Dissolved)	mg/l		X
Oil and Grease	mg/l		
Potassium (Dissolved)	mg/l	X	X
Total Alkalinity	mg/l		X
Total Dissolved Solids	mg/l	X	X
Total Hardness (CaCO <sub>3</sub> )	mg/l		X
Total Suspended Solids	mg/l		
Selenium (Dissolved)	mg/l		X
Sodium (Dissolved)	mg/l	X	X
Sulfate	mg/l	X	X
Zinc (Dissolved)	mg/l		X
Anions	meq/l	X	X
Cations	meq/l	X	X



Canyon Fuel Company, LLC  
SCM/Dugout Canyon Mine

Mining and Reclamation Plan  
October 15, 2007 ~~September 18, 2007~~

## **APPENDIX 7-1**

Water Rights Data



Select Related Information

(WARNING: Water Rights makes NO claims as to  
the accuracy of this data.) RUN DATE: 10/08/2007

WATER RIGHT: **90-572**  
NO.:

APPLICATION/CLAIM NO.:

CERT.

=====

OWNERSHIP\*\*\*\*\*

\*\*\*\*\*

=====

NAME: George J. Conover  
ADDR: Ferron UT 84532

=====

DATES,  
ETC.\*\*\*\*\*

\*\*\*\*\*

=====

=====

LAND OWNED BY APPLICANT? Yes

FILED: | PRIORITY: 00/00/1885 | PUB BEGAN: | PUB

ENDED: | NEWSPAPER:

ProtestEnd: | PROTESTED: [No ] | HEARNG HLD: | SE

ACTION: [ ] | ActionDate: | PROOF DUE:

EXTENSION: | ELEC/PROOF:[ ] | ELEC/PROOF:

| CERT/WUC: | LAP, ETC: | LAPS LETTER:

RUSH LETTR: | RENOVATE: | RECON REQ: | TYPE:

[ ]

PD Book No. Map: 420

Type of Right: Diligence Claim Source of Info: Proposed

Determination Status:

=====

=====

LOCATION OF WATER RIGHT\*\*\* (Points of Diversion: Click on Location to  
access PLAT Program.)\*\*\*\*\*

=====

=====

FLOW: 0.066 cfs SOURCE: Unnamed

Spring

COUNTY: Carbon COMMON DESCRIPTION:

POINT OF DIVERSION:

( 1) Stockwatering directly on spring located at S 660 ft. E 660 ft.  
from N4 corner, Sec 15, T13S, R13E, SLBM.

COMMENT: Administratively updated by State  
Engineer.

=====

=====

USES OF WATER

RIGHT\*\*\*\*\*

\*\*\*\*\*

=====

=====

SUPPLEMENTAL GROUP NO. 613899. Water Rights Appurtenant to the  
following use(s):

90-493,494,495,496,497  
498,499,500,501,502  
517,518,519,520,521  
522,523,524,525,526  
528,529,530,531,532  
533,534,535,536,537  
538,539,540,541,542  
543,544,545,546,547  
548,549,550,551,552  
553,554,555,556,557  
558,559,560,561,562  
563,564,565,566,567  
568,569,570,571,572  
573,574,575,576,577  
578,579,580,581,582  
583,584,586,587,588  
589,590,591,592,593  
594,595,596,597,598  
599,712,713,714,715  
716,717,718,719,720  
721,722,723,724,725  
726,727,728,729,730  
731,732,733,734,735  
736,737,738,739,740  
741,742,743,744,745  
746,747,748,749,750  
751,752,753,754,755  
756,757,758,759,760  
761,762,763,764,765  
766,767,768,769,770  
771,772,773,774,775  
776,777,778,779,780  
781,782,783,784,785  
786,787,788,789,790  
791,792,793,794,795  
796,797,798,799,800  
801,802,803,804,805  
806,807,808,809,810  
811,812,813,814,815  
816,817,818,819,821  
822,823,824,825,826  
827,828,829,830,831  
832,840,841,842,843  
844,845,846,847,848  
849,850,851,852,853  
854,856,857,858,859  
860,861,862,863,864  
865,866,867,868,869

870,871

```
.....
#####STOCKWATER:                               Group Total: 1000.0000 Stock
Div Limit: 28.0 acft.      PERIOD OF USE: 01/01 TO 12/31
***Sole Supply for Stockwatering for 90-572 in this Group has NOT YET
been evaluated***
=====
=====
PLACE OF USE for
STOCKWATERING*****
*****
=====
=====
SOUTH-WEST¼      SOUTH-EAST¼      NORTH-WEST¼      NORTH-EAST¼
NW NE SW SE      NW NE SW SE      NW
NE SW SE      NW NE SW SE
Sec 15 T 13S R 13E SLBM      * : : : *      * X: : : *      * :
: : *      * : : : *
=====
=====
OTHER
COMMENTS*****
*****
=====
=====
3/48 Interest
*****
*****
*****END OF D
A T A*****
*****
*****
```

x

Select Related Information

(WARNING: Water Rights makes NO claims as to  
the accuracy of this data.) RUN DATE: 10/08/2007

WATER RIGHT: **91-543**  
NO.:

APPLICATION/CLAIM NO.:

CERT.

=====

OWNERSHIP\*\*\*\*\*  
\*\*\*\*\*

=====

NAME: Canyon Fuel Company LLC  
ADDR: Attn: Property Administration  
CityPlace One Suite 300  
St. Louis MO 63141

INTEREST: 100% REMARKS: c/o Ark Land Company

=====

DATES,  
ETC.\*\*\*\*\*  
\*\*\*\*\*

=====

LAND OWNED BY APPLICANT?

FILED: | PRIORITY: 00/00/1869 | PUB BEGAN: | PUB  
ENDED: | NEWSPAPER:  
ProtestEnd: | PROTESTED: [No ] | HEARNG HLD: | SE  
ACTION: [ ] | ActionDate: | PROOF DUE:  
EXTENSION: | ELEC/PROOF:[ ] | ELEC/PROOF:  
| CERT/WUC: 09/15/1964 | LAP, ETC: | LAPS LETTER:  
RUSH LETTR: | RENOVATE: | RECON REQ: | TYPE:  
[ ]  
PD Book No. 3 Map: 34  
Type of Right: Diligence Claim Source of Info: Proposed  
Determination Status:

=====

=====

LOCATION OF WATER RIGHT\*\*\* (Points of Diversion: Click on Location to  
access PLAT Program.)\*\*\*\*\*

=====

FLOW: SOURCE: Soldier  
Creek  
COUNTY: Carbon COMMON DESCRIPTION:

POINT OF DIVERSION -- POINT TO POINT:

( 1)Stockwatering directly on stream from a point at N 660 ft. E 660 ft. from SW corner, Sec 05, T13S, R12E, SLBM, to a point at N 660 ft. E 660 ft. from W4 corner, Sec 08, T13S, R12E, SLBM.

COMMENT: Administratively updated by State Engineer.

USES OF WATER

RIGHT\*\*\*\*\*

SUPPLEMENTAL GROUP NO. 615994. Water Rights Appurtenant to the following use(s):  
91-522,523,524,525,526  
527,528,529,530,531  
532,533,534,535,543  
552,743

###STOCKWATER: Group Total: 300.0000 Stock  
Div Limit: 8.4 acft. PERIOD OF USE: 01/01 TO 12/31  
\*\*\*Sole Supply for Stockwatering for 91-543 in this Group has NOT YET been evaluated\*\*\*

PLACE OF USE for

STOCKWATERING\*\*\*\*\*

SOUTH-WEST¼		SOUTH-EAST¼		NORTH-WEST¼				NORTH-EAST¼							
NE	SW	SE	NW	NE	SW	SE	NW	NE	SW	SE	NW				
Sec 05	T 13S	R 12E	SLBM	*	:	:	:	*	*	:	:	:	*	*	:
:	X:	*	*	:	:	:	:	*	:	:	:	:	*	*	:
Sec 08	T 13S	R 12E	SLBM	*	:	:	X:	*	*	:	:	:	*	*	:
:	:	*	*	:	:	:	:	*	:	:	:	:	*	*	:

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\*\*\*\*\*E N D O F D  
A T A\*\*\*\*\*  
\*\*\*\*\*



Select Related Information

(WARNING: Water Rights makes NO claims as to  
the accuracy of this data.) RUN DATE: 10/08/2007

WATER RIGHT: **91-3498**  
NO.:

APPLICATION/CLAIM NO.:

CERT.

OWNERSHIP\*\*\*\*\*  
\*\*\*\*\*

NAME: W. Lavon & Marianne W. Day

ADDR: Castle Dale UT

REMARKS: joint tenants

DATES,

ETC.\*\*\*\*\*  
\*\*\*\*\*

LAND OWNED BY APPLICANT? Yes

FILED: |PRIORITY: 00/00/1869|PUB BEGAN: |PUB

ENDED: |NEWSPAPER:

ProtestEnd: |PROTESTED: [No ]|HEARNG HLD: |SE

ACTION: [ ]|ActionDate: |PROOF DUE:

EXTENSION: |ELEC/PROOF:[ ]|ELEC/PROOF:

|CERT/WUC: 03/08/1972|LAP, ETC: |LAPS LETTER:

RUSH LETTR: |RENOVATE: |RECON REQ: |TYPE:

[ ]

PD Book No. 5 Map: 46

Type of Right: Diligence Claim

Source of Info: Proposed

Determination Status:

LOCATION OF WATER RIGHT\*\*\* (Points of Diversion: Click on Location to  
access PLAT Program.)\*\*\*\*\*

FLOW: 0.011 cfs

SOURCE: Unnamed

Spring

COUNTY: Carbon

COMMON DESCRIPTION:

POINT OF DIVERSION:

( 1) Stockwatering directly on spring located at N 660 ft. E 660 ft.  
from S4 corner, Sec 22, T13S, R13E, SLBM.



COMMENT: Administratively updated by State

Engineer.

**USES OF WATER**

**RIGHT**

SUPPLEMENTAL GROUP NO. 614121. Water Rights Appurtenant to the following use(s):

91-1661,1662,1664,1665,1666  
1667,1668,1669,1671,1672  
1673,1674,1682,1683,1685  
1686,1687,1688,1689,1690  
1692,1693,1694,1695,1703  
1704,1706,1707,1708,1709  
3474,3475,3476,3477,3478  
3479,3480,3481,3482,3483  
3484,3485,3486,3487,3488  
3489,3490,3491,3492,3493  
3494,3495,3496,3497,3498

###STOCKWATER: Group Total: 1000.0000 Stock  
Div Limit: 15.0 acft. PERIOD OF USE: 01/01 TO 12/31  
\*\*\*Sole Supply for Stockwatering for 91-3498 in this Group has NOT YET been evaluated\*\*\*

**PLACE OF USE for**

**STOCKWATERING**

SOUTH-WEST¼				SOUTH-EAST¼				NORTH-WEST¼				NORTH-EAST¼			
NE	SW	SE		NW	NE	SW	SE	NW	NE	SW	SE	NW	NE	SW	SE
Sec 22	T 13S	R 13E	SLBM	*	:	:	:	*	*	:	:	:	*	*	:
:	:	*	*	:	:	X:	*								

**OTHER**

**COMMENTS**

7/24 Interest.

\*\*\*\*\*  
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A T A\*\*\*\*\*  
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\*\*\*\*\*



Select Related Information

(WARNING: Water Rights makes NO claims as to  
the accuracy of this data.) RUN DATE: 10/08/2007

WATER RIGHT: **91-4797**  
NO.:

APPLICATION/CLAIM NO.:

CERT.

=====

OWNERSHIP\*\*\*\*\*  
\*\*\*\*\*

=====

NAME: Ralph Stevenson  
ADDR: P.O. Box 52  
Wellington UT 84542

NAME: Glen Wells  
ADDR: P.O. Box 52  
Wellington UT 84542

=====

DATES,  
ETC.\*\*\*\*\*  
\*\*\*\*\*

=====

=====

LAND OWNED BY APPLICANT?

FILED: 04/05/1988|PRIORITY: 00/00/1869|PUB BEGAN: |PUB  
ENDED: |NEWSPAPER:  
ProtestEnd: |PROTESTED: [No ]|HEARNG HLD: |SE  
ACTION: [ ]|ActionDate: |PROOF DUE:  
EXTENSION: |ELEC/PROOF:[ ]|ELEC/PROOF:  
|CERT/WUC: 04/05/1988|LAP, ETC: |LAPS LETTER:  
RUSH LETTR: |RENOVATE: |RECON REQ: |TYPE:  
[ ]  
PD Book No. Map: 57  
Type of Right: Diligence Claim Source of Info: Water  
User's Claim Status: Water User's Claim

=====

=====

LOCATION OF WATER RIGHT\*\*\* (Points of Diversion: Click on Location to  
access PLAT Program.)\*\*\*\*\*

=====

=====

FLOW: SOURCE: Unnamed  
Stream  
COUNTY: Carbon COMMON DESCRIPTION:

POINT OF DIVERSION -- POINT TO POINT:

( 1) Stockwatering directly on stream from a point at N 660 ft. E 660 ft. from S4 corner, Sec 34, T13S, R13E, SLBM, to a point at N 660 ft. W 660 ft. from S4 corner, Sec 34, T13S, R13E, SLBM.

COMMENT: Administratively updated by State Engineer.

SOURCE: Unnamed Stream

=====

**USES OF WATER**

**RIGHT\*\*\*\*\***

=====

SUPPLEMENTAL GROUP NO. 615674. Water Rights Appurtenant to the following use(s):

91-1717,1719,1720,1721,1722

1724,1725,1726,3253,4795

4796,4797,4798

.....

###STOCKWATER: Group Total: 120.0000 Stock

Div Limit: PERIOD OF USE: 04/15 TO 10/31

**\*\*\*Sole Supply for Stockwatering for 91-4797 in this Group has NOT YET been evaluated\*\*\***

=====

**PLACE OF USE for**

**STOCKWATERING\*\*\*\*\***

=====

SOUTH-WEST¼			SOUTH-EAST¼			NORTH-WEST¼			NORTH-EAST¼						
NE	SW	SE	NW	NE	SW	SE	NW	NE	SW	SE	NW				
Sec 34	T 13S	R 13E	SLBM	*	:	:	:	*	*	:	:	:	*	*	:
:	:	X*	*	:	:	X:	*								

\*\*\*\*\*

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\*\*\*\*\*E N D O F D

A T A\*\*\*\*\*

\*\*\*\*\*

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Select Related Information

(WARNING: Water Rights makes NO claims as to  
the accuracy of this data.) RUN DATE: 10/08/2007

WATER RIGHT: **91-4798**  
NO.:

APPLICATION/CLAIM NO.:

CERT.

=====

OWNERSHIP\*\*\*\*\*  
\*\*\*\*\*

=====

NAME: Ralph Stevenson  
ADDR: PO Box 52  
Wellington, Utah 84542

NAME: Glen Wells  
ADDR: PO Box 52  
Wellington, Utah 84542

=====

DATES,  
ETC. \*\*\*\*\*  
\*\*\*\*\*

=====

=====

LAND OWNED BY APPLICANT? Yes

FILED:	PRIORITY:	/	/1869	PUB BEGAN:	PUB
ENDED:	NEWSPAPER:				
ProtestEnd:	PROTESTED: [No	]	HEARNG HLD:	SE	
ACTION: [	] ActionDate:		PROOF DUE:		
EXTENSION:	ELEC/PROOF:[		ELEC/PROOF:		
CERT/WUC: 02/22/1990	LAP, ETC:		LAPS LETTER:		
RUSH LETTR:	RENOVATE:		RECON REQ:	TYPE:	
[		]			

PD Book No. Map: 57

Type of Right: Pending Adjudication Claim Source of Info: Water  
User's Claim Status: Water User's Claim

=====

=====

LOCATION OF WATER RIGHT\*\*\* (Points of Diversion: Click on Location to  
access PLAT Program.) \*\*\*\*\*

=====

=====

FLOW: 0.015 cfs SOURCE: Unnamed  
Spring  
COUNTY: Carbon COMMON DESCRIPTION: 7 miles NNW of Sunnyside

POINT OF SPRING:

(1) S 1980 ft W 660 ft from NE cor, Sec 33, T 13S, R 13E, SLBM

Diverting Works:

Source:

USES OF WATER

RIGHT\*\*\*\*\*  
\*\*\*\*\*

SUPPLEMENTAL GROUP NO. 615674. Water Rights Appurtenant to the following use(s):

91-1717,1719,1720,1721,1722

1724,1725,1726,3253,4795

4796,4797,4798

###STOCKWATER:

Group Total: 120.0000 Stock

Div Limit:

PERIOD OF USE: 04/15 TO 10/31

\*\*\*Sole Supply for Stockwatering for 91-4798 in this Group has NOT YET been evaluated\*\*\*

PLACE OF USE for

STOCKWATERING\*\*\*\*\*  
\*\*\*\*\*

SOUTH-WEST¼

SOUTH-EAST¼

NORTH-WEST¼

NORTH-EAST¼

NE SW SE

NW NE SW SE

NW NE SW SE

NW NE SW SE

NW

Sec 33 T 13S R 13E SLBM

\* : : : \*

\* : : : X\*

\* :

: : \* : : \*

\*\*\*\*\*  
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\*\*\*\*\*E N D O F D  
A T A\*\*\*\*\*

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x

Select Related Information

(WARNING: Water Rights makes NO claims as to the accuracy of this data.) RUN DATE: 10/08/2007 Page 1

CHANGE: a19877

WATER RIGHT: 91-4987 CERT. NO.:

AMENDATORY? No

BASE WATER RIGHTS: 91-4987

RIGHT EVIDENCED BY: 91-23 & 491 (A5039) Cert. No. 1685

CHANGES: Point of Diversion [X], Place of Use [X], Nature of Use [X], Reservoir Storage [ ].

\*

NAME: Canyon Fuel Company LLC.

ADDR: 6955 Union Park Center Suite 550

Midvale UT 84047

INTEREST: 100%

REMARKS:

\*

FILED: 03/19/1996|PRIORITY: 01/30/1913|ADV BEGAN: 04/25/1996|ADV

ENDED: 05/02/1996|NEWSPAPER: Sun Advocate

ProtestEnd:05/22/1996|PROTESTED: [No ]|HEARNG HLD: |SE

ACTION: [Approved]|ActionDate:07/16/1996|PROOF DUE:

EXTENSION: |ELEC/PROOF:[ ]|ELEC/PROOF:

|CERT/WUC: |LAP, ETC: 03/31/1997|LAPS LETTER:

RUSH LETTR: |RENOVATE: |RECON REQ: |TYPE:

[ ]

Status: Terminated

\*\*\*\*\*  
\*\*\*\*\*  
\*\*\*\*\*H E R E T O F O R E\*\*\*\*\*  
\*\*\*\*\*H E R E A F T E R\*\*\*\*\*  
\*\*\*\*\*  
\*\*\*\*\*

|FLOW: 4.0 cfs

||FLOW: 500.0 acre-feet

|SOURCE: Dugout Canyon Creek

||SOURCE: Dugout Canyon Creek

|COUNTY: Carbon

||COUNTY: Carbon COM DESC: 11 miles NE of Wellington

This water right will be used to

	provide dust suppression and fire protection		
	water for both surface and underground		
	operations at the Dugout Canyon Mine.		
	-----		-----
	-----		-----

	POINT(S) OF DIVERSION ----->		
	CHANGED AS FOLLOWS: (Click Location link for WRPLAT)		
	-----		-----
	Point Surface:		
	Point Surface:		
	(1) N 1260 ft E 120 ft from SW cor, Sec 03, T 14S, R 12E, SLBM		(1)
	N 3360 ft E 1860 ft from SW cor, Sec 23, T 13S, R 12E, SLBM		
	Dvrting Wks:		
	Dvrting Wks: Stilling well in creek with submersible pump		
	Source:		
	Source: Dugout Canyon Creek		
	Stream Alt?: No		
	-----		-----
	-----		-----

	PLACE OF USE ----->		
	CHANGED as follows:		
	-----		-----
	--NW¼-- --NE¼-- --SW¼-- --SE¼--		--NW¼-- --NE¼-- --SW¼-- --SE¼--
	N N S S   N N S S   N N S S   N N S S		N N S S   N N S S   N N S S   N N S S
	W E W E   W E W E   W E W E   W E W E		W E W E   W E W E   W E W E   W E W E
	Sec 09 T 14S R 12E SLBM * : : : ** : : : ** : : : ** :X:X:X*		Sec
	09 T 13S R 12E SLBM * : : : ** : : : ** : : : ** :X:X*		
	Sec 10 T 14S R 12E SLBM *X:X:X: **X: :X: **X:X:X:X** : : : *		Sec
	10 T 13S R 12E SLBM * : : : ** : : : **X:X:X:X**X:X:X:X*		
	Sec 15 T 14S R 12E SLBM * :X: :X** : :X: ** :X:X:X**X: :X: *		Sec
	11 T 13S R 12E SLBM * : : : ** : : : **X:X:X:X**X:X:X:X*		
	Sec 22 T 14S R 12E SLBM *X:X:X:X** : : : ** : : : ** : : : *		Sec
	14 T 13S R 12E SLBM *X:X:X:X**X:X:X:X**X:X:X:X**X:X:X*X*		
			Sec
	15 T 13S R 12E SLBM *X:X:X:X**X:X:X:X**X:X:X:X**X:X:X*X*		
			Sec
	16 T 13S R 12E SLBM *X:X:X:X**X:X:X:X**X:X:X:X**X:X:X*X*		



17 T 13S R 12E SLBM	* : : : ** : : : ** :X: :X**X:X:X:X*	Sec
20 T 13S R 12E SLBM	* :X:X:X**X:X: : ** : : : ** : : : *	Sec
21 T 13S R 12E SLBM	*X:X: : **X:X:X:X** : : : ** : : : *	Sec
22 T 13S R 12E SLBM	*X:X:X:X**X:X:X:X**X:X: : **X:X: : *	Sec
23 T 13S R 12E SLBM	*X:X:X:X**X: :X: ** : : : ** : : : *	Sec

NATURE OF USE ----->

CHANGED as follows:

SUPPLEMENTAL to Other Water Rights: Yes

SUPPLEMENTAL to Other Water Rights: No

IRR: 605.7000 acs Sol/Sup: 293.4300 acs USED 04/01 - 09/30

STK: 810.0000 Cattle or Equivalent USED 04/01 - 09/30

District: Dugout Canyon

USED 01/01 - 12/31

MIN:

Name: Dugout Canyon

Ores: Coal

OTHER: Dust suppression and USED 01/01 - 12/31

OTH:

fire protection

RESERVOIR STORAGE -->

AS HERETOFORE

SAME

Storage 03/01 to 07/31, in Clark's Valley Reservoir

\*\*\*\*\*

x

Select Related Information

(WARNING: Water Rights makes NO claims as to the accuracy of this data.) RUN DATE: 10/08/2007 Page 1

CHANGE: t22301

WATER RIGHT: 91-23 CERT. NO.:

AMENDATORY? No

BASE WATER RIGHTS: 91-23

RIGHT EVIDENCED BY: 91-23, 491 (A5039) Cert. 1685

CHANGES: Point of Diversion [X], Place of Use [X], Nature of Use [X], Reservoir Storage [ ].

\*

NAME: Nielson Construction Company Inc.

ADDR: P.O. Box 620

Huntington UT 84528

REMARKS:

\*

FILED: 06/12/1998|PRIORITY: 06/12/1998|ADV BEGAN: |ADV  
ENDED: |NEWSPAPER:  
ProtestEnd: |PROTESTED: [No ]|HEARNG HLD: |SE  
ACTION: [Approved]|ActionDate:06/15/1998|PROOF DUE:  
EXTENSION: |ELEC/PROOF:[ ]|ELEC/PROOF:  
|CERT/WUC: |LAP, ETC: 06/11/1999|LAPS LETTER:  
RUSH LETTR: |RENOVATE: |RECON REQ: |TYPE:  
[ ]

Status: Lapsed

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\*\*\*\*\*HERE TO FORE\*\*\*\*\*  
\*\*\*\*\*HERE A F T E R\*\*\*\*\*  
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|FLOW: 19.0 acre-feet

||FLOW: 19.0 acre-feet

|SOURCE: Dugout Canyon Creek

||SOURCE: Dugout Canyon Creek

|COUNTY: Carbon

||COUNTY: Carbon COM DESC: 8 miles N. of Sunnyside Jct.

|  
Water will be used to construct Dugout

Canyon Road.

POINT(S) OF DIVERSION ----->

CHANGED AS FOLLOWS: (Click Location link for WRPLAT)

Point Surface:

Point Surface:

(1) N 1260 ft E 120 ft from SW cor, Sec 03, T 14S, R 12E, SLBM (1)  
S 2500 ft E 1230 ft from NW cor, Sec 23, T 13S, R 12E, SLBM

Dvrting Wks:

Dvrting Wks:

Source:

Source:

S 2300 ft E 2010 ft from NW cor, Sec 34, T 13S, R 12E, SLBM

Dvrting Wks:

Source:

Stream Alt?: No

PLACE OF USE ----->

CHANGED as follows:

--NW¼--	--NE¼--	--SW¼--	--SE¼--
N N S S	N N S S	N N S S	N N S S
N N S S	N N S S	N N S S	N N S S
W E W E	W E W E	W E W E	W E W E

22 T 13S R 12E SLBM \*X:X:X:X\*X:X:X\*X\*X:X:X\*X\*X\*X\* | | Sec

23 T 13S R 12E SLBM \*X:X:X:X\*X:X:X\*X\*X:X:X\*X\*X\*X\* | | Sec

27 T 13S R 12E SLBM \*X:X:X:X\*X:X:X\*X\*X:X:X\*X\*X\*X\* | | Sec

34 T 13S R 12E SLBM \*X:X:X:X\*X:X:X\*X\*X:X:X\*X\*X\*X\* | | Sec

13 T 14S R 11E SLBM \*X:X:X:X\*X:X:X\*X\*X:X:X\*X\*X\*X\* | | Sec

24 T 14S R 11E SLBM	*X:X:X:X**X:X:X:X**X:X:X:X**X:X:X:X*	Sec
03 T 14S R 12E SLBM	*X:X:X:X**X:X:X:X**X:X:X:X**X:X:X:X*	Sec
04 T 14S R 12E SLBM	*X:X:X:X**X:X:X:X**X:X:X:X**X:X:X:X*	Sec
05 T 14S R 12E SLBM	*X:X:X:X**X:X:X:X**X:X:X:X**X:X:X:X*	Sec
08 T 14S R 12E SLBM	*X:X:X:X**X:X:X:X**X:X:X:X**X:X:X:X*	Sec
17 T 14S R 12E SLBM	*X:X:X:X**X:X:X:X**X:X:X:X**X:X:X:X*	Sec
18 T 14S R 12E SLBM	*X:X:X:X**X:X:X:X**X:X:X:X**X:X:X:X*	Sec

NATURE OF USE ----->  
 CHANGED as follows:

SUPPLEMENTAL to Other Water Rights: No  
 SUPPLEMENTAL to Other Water Rights: No

IRR: 605.7000 acs Sol/Sup: 293.4300 acs USED 04/01 - 09/30

STK: 810.0000 Cattle or Equivalent USED 04/01 - 09/30

ROAD MAINTENANCE: Road construction and USED 06/12 - 06/11  
 dust suppression.

RESERVOIR STORAGE -->  
 AS HERETOFORE

Storage 03/01 to 07/31, in Clark's Valley Reservoir

with a maximum capacity of 460.500 acre-feet, located in:

--NW¼-- --NE¼-- --SW¼-- --SE¼--

Height of Dam: ft | N N S S | N N S S | N N S S | N N S S |

Area Inundat	acs W E W E  W E W E  W E W E  W E W E
Sec 10 T 14S R 12E SLBM	* : : : ** : : : ** : : :X** : :X: *
Sec 15 T 14S R 12E SLBM	* :X: : **X: : : ** : : : ** : : : *
-----	-----  -----
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Select Related Information

(WARNING: Water Rights makes NO claims as to the accuracy of this data.) RUN DATE: 10/08/2007 Page 1

CHANGE: t22354

WATER RIGHT: 91-519 CERT. NO.:

AMENDATORY? No

BASE WATER RIGHTS: 91-519

RIGHT EVIDENCED BY: 91-519

CHANGES: Point of Diversion [X], Place of Use [X], Nature of Use [X], Reservoir Storage [ ].

-----  
-----\*

NAME: Canyon Fuels Company LLC  
ADDR: 6955 Union Park Center, Suite 550  
Midvale UT 84047

REMARKS:

-----  
-----\*  
FILED: 05/21/1998|PRIORITY: 06/30/1998|ADV BEGAN: |ADV  
ENDED: |NEWSPAPER:  
ProtestEnd: |PROTESTED: [No ]|HEARNG HLD: |SE  
ACTION: [Approved]|ActionDate:07/01/1998|PROOF DUE:  
EXTENSION: |ELEC/PROOF:[ ]|ELEC/PROOF:  
|CERT/WUC: |LAP, ETC: 06/30/1999|LAPS LETTER:  
RUSH LETTR: |RENOVATE: |RECON REQ: |TYPE:  
[ ]

Status: Lapsed

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\*\*\*\*\*H E R E T O F O R E\*\*\*\*\*  
\*\*\*\*\*H E R E A F T E R\*\*\*\*\*  
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|FLOW: 1.0 cfs OR 224.8 acre-feet  
||FLOW: 0.25 cfs OR 84.0 acre-feet  
|-----|

|SOURCE: Soldier Creek  
||SOURCE: Soldier Creek  
|-----|

|COUNTY: Carbon  
||COUNTY: Carbon COM DESC: Soldier Creek Mine  
|-----|

|  
This application is being filed to |



| allow the applicant to divert make-up water  
| from Soldier Creek and pump it into  
| the mine through a former discharge line  
| for use as described herein.

| POINT(S) OF DIVERSION ----->

| CHANGED AS FOLLOWS: (Click Location link for WRPLAT)

| Point Surface:

| Point Surface:

| (1) N 1040 ft E 740 ft from SW cor, Sec 19, T 13S, R 12E, SLBM | (1)  
N 30 ft W 1140 ft from SE cor, Sec 07, T 13S, R 12E, SLBM |

| Dvrting Wks:

Dvrting Wks: Portable pump & pipelines to place of use

| Source:

Source: Soldier Creek

| Stream Alt?: No

| PLACE OF USE ----->

| CHANGED as follows:

| --NW¼-- --NE¼-- --SW¼-- --SE¼-- ||  
--NW¼-- --NE¼-- --SW¼-- --SE¼-- |  
N N S S	N N S S	N N S S	N N S S	
N N S S	N N S S	N N S S	N N S S	
W E W E	W E W E	W E W E	W E W E	
W E W E	W E W E	W E W E	W E W E	
Sec 25 T 13S R 11E SLBM \* : : : \*\* : : : \*\* : : : \*\* :X: :X\*	Sec			
07 T 13S R 12E SLBM \* : : : \*\* : : : \*\* : : : \*\*X:X:X:X\*				
Sec 30 T 13S R 12E SLBM \* : : : \*\* : : : \*\* :X: \*\* : : : \*				

NATURE OF USE ----->  
 CHANGED as follows:

---

SUPPLEMENTAL to Other Water Rights: No  
 SUPPLEMENTAL to Other Water Rights: No

---

IRR: 73.1000 acs Sol/Sup: acs USED 04/01 - 10/31||  
 .....|.....  
 STK: 130.0000 Cattle or Equivalent USED 01/01 - 12/31||  
 .....|.....  
 District: Soldier Creek USED 07/01 - 06/30| MIN:  
 Name: Soldier Creek ||  
 Ores: Coal ||  
 .....|.....  
 .....|.....  
 INDUSTRIAL: In-mine process water USED 07/01 - 06/30| OTH:  
 and dust suppression ||  
 .....|.....

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Select Related Information

(WARNING: Water Rights makes NO claims as to the accuracy of this data.) RUN DATE: 10/08/2007 Page 1

CHANGE: t22425

WATER RIGHT: 91-519 CERT. NO.:

AMENDATORY? No

BASE WATER RIGHTS: 91-519

RIGHT EVIDENCED BY: 91-519

CHANGES: Point of Diversion [X], Place of Use [X], Nature of Use [X], Reservoir Storage [ ].

\*

\*

NAME: Canyon Fuel Company LLC  
ADDR: 6955 Union Park Center, Suite 550  
Midvale UT 84047

REMARKS:

\*

\*

FILED: 08/03/1998|PRIORITY: 08/03/1998|ADV BEGAN: |ADV  
ENDED: |NEWSPAPER:  
ProtestEnd: |PROTESTED: [No ]|HEARNG HLD: |SE  
ACTION: [Approved]|ActionDate:08/03/1998|PROOF DUE:  
EXTENSION: |ELEC/PROOF:[ ]|ELEC/PROOF:  
|CERT/WUC: |LAP, ETC: 11/30/1998|LAPS LETTER:  
RUSH LETTR: |RENOVATE: |RECON REQ: |TYPE:  
[ ]

Status: Lapsed

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\*\*\*\*\*HERE TO FORE\*\*\*\*\*  
\*\*\*\*\*HERE A F T E R\*\*\*\*\*  
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|FLOW: 2.0 acre-feet

||FLOW: 2.0 acre-feet

|SOURCE: Soldier Creek

||SOURCE: Pine Cyn., Soldier, Fish, & Dugout Creeks

|COUNTY: Carbon

||COUNTY: Carbon COM DESC: 12 miles NE of Wellington

The water from this permit will be

used to drill locations A,B,E, & F in 1998.

See attached sheet.

POINT(S) OF DIVERSION ----->

CHANGED AS FOLLOWS: (Click Location link for WRPLAT)

Point Surface:

Point Surface:

(1) N 1040 ft E 740 ft from SW cor, Sec 19, T 13S, R 12E, SLBM (1)  
N 2190 ft W 650 ft from SE cor, Sec 04, T 13S, R 12E, SLBM

Dvrting Wks:

Dvrting Wks: Pond

Source:

Source:

N 1680 ft E 460 ft from SW cor, Sec 06, T 13S, R 12E, SLBM

Dvrting Wks:

Source: Soldier Creek

N 310 ft W 860 ft from SE cor, Sec 09, T 13S, R 12E, SLBM

Dvrting Wks: Pond

Source:

S 1100 ft E 1400 ft from NW cor, Sec 15, T 13S, R 12E, SLBM

Dvrting Wks: Pond

Source:

S 150 ft E 710 ft from W4 cor, Sec 23, T 13S, R 12E, SLBM

Dvrting Wks:

Source: Dogout Creek

Stream Alt?: No

PLACE OF USE ----->

CHANGED as follows:

```
-----|-----
|                                     --NW¼-- --NE¼-- --SW¼-- --SE¼-- ||
--NW¼-- --NE¼-- --SW¼-- --SE¼-- |
|                                     |N N S S|N N S S|N N S S|N N S S||
|N N S S|N N S S|N N S S|N N S S| |
|                                     |W E W E|W E W E|W E W E|W E W E||
|W E W E|W E W E|W E W E|W E W E| |
|Sec 25 T 13S R 11E SLBM      * : : : ** : : : ** : : : ** :X: :X*|Sec
15 T 13S R 12E SLBM      * : : : ** : : : ** :X: : ** : : : *|
|Sec 30 T 13S R 12E SLBM      * : : : ** : : : ** : :X: ** : : : *|Sec
16 T 13S R 12E SLBM      * : : : ** : : : ** : : : ** :X: : *|
|                                     |Sec
21 T 13S R 12E SLBM      * : : : ** :X: : ** : : : ** : : : *|
|                                     |Sec
22 T 13S R 12E SLBM      * : : : ** :X: : ** : : : ** : : : *|
```

NATURE OF USE ----->

CHANGED as follows:

SUPPLEMENTAL to Other Water Rights: No  
SUPPLEMENTAL to Other Water Rights: No

IRR: 73.1000 acs Sol/Sup: acs USED 04/01 - 10/31||

STK: 130.0000 Cattle or Equivalent USED 01/01 - 12/31||

OIL EXPLORATION: Exploration drilling USED 08/03 - 11/30|OTH:

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Select Related Information

(WARNING: Water Rights makes NO claims as to the accuracy of this data.) RUN DATE: 10/08/2007 Page 1

CHANGE: t23594

WATER RIGHT: 91-519 CERT. NO.:

AMENDATORY? No

BASE WATER RIGHTS: 91-519

RIGHT EVIDENCED BY: 91-519

CHANGES: Point of Diversion [X], Place of Use [X], Nature of Use [X], Reservoir Storage [ ].

\*

\*

NAME: Canyon Fuel Company LLC

ADDR: 6955 Union Park Center Suite 550

Midvale UT 84047

INTEREST: 100%

REMARKS:

\*

\*

FILED: 07/26/1999|PRIORITY: 07/26/1999|ADV BEGAN:

|ADV

ENDED: |NEWSPAPER:

ProtestEnd: |PROTESTED: [No ]|HEARNG HLD:

|SE

ACTION: [Approved]|ActionDate:08/10/1999|PROOF DUE:

EXTENSION: |ELEC/PROOF:[ ]|ELEC/PROOF:

|CERT/WUC: |LAP, ETC: 11/30/1999|LAPS LETTER:

RUSH LETTR: |RENOVATE: |RECON REQ:

|TYPE:

[ ]

Status: Lapsed

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\*\*\*\*\*HERE TO F O R E\*\*\*\*\*  
\*\*\*\*\*H E R E A F T E R\*\*\*\*\*  
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|FLOW: 2.0 acre-feet

||FLOW: 2.0 acre-feet

|

|SOURCE: Soldier Creek

||SOURCE: Trib. to Pine, Soldier, Fish and Dugout Creeks

|

|COUNTY: Carbon

||COUNTY: Carbon COM DESC: 12 miles NE of Wellington

|

The water from this permit will be

used to drill locations G, H, I, J, & N-alt

in 1999. See attached sheets.

POINT(S) OF DIVERSION ----->

CHANGED AS FOLLOWS: (Click Location link for WRPLAT)

Point Surface:

Point Surface:

(1) N 1040 ft E 740 ft from SW cor, Sec 19, T 13S, R 12E, SLBM (1)

N 2190 ft W 650 ft from SE cor, Sec 04, T 13S, R 12E, SLBM

Dvrting Wks: Earthen ditches

Dvrting Wks: Pond

Source:

Source:

N 1680 ft E 460 ft from SW cor, Sec 05, T 13S, R 12E, SLBM (2)

Dvrting Wks:

Source: Soldier Creek

N 2000 ft W 50 ft from SE cor, Sec 09, T 13S, R 12E, SLBM (3)

Dvrting Wks: Pond

Source:

N 700 ft W 2400 ft from SE cor, Sec 14, T 13S, R 12E, SLBM (4)

Dvrting Wks:

Source: Dugout Creek

S 1100 ft E 1400 ft from NW cor, Sec 15, T 13S, R 12E, SLBM (5)

Dvrting Wks: Pond

Source:

S 750 ft W 1400 ft from NE cor, Sec 16, T 13S, R 12E, SLBM (6)

Dvrting Wks:

Source: Fish Creek

S 150 ft E 710 ft from W4 cor, Sec 23, T 13S, R 12E, SLBM (7)



Dvrting Wks:

Source: Dugout Creek

Stream Alt?: No

PLACE OF USE ----->

CHANGED as follows:

	--NW¼--	--NE¼--	--SW¼--	--SE¼--	
					N N S S N N S S N N S S N N S S
					W E W E W E W E W E W E W E W E
Sec 25 T 13S R 11E SLBM	*	:	:	:	** : : : ** : : : ** :X: :X*
14 T 13S R 12E SLBM	*	:	:	:	X** : : : ** : : : ** :X: : *
15 T 13S R 12E SLBM	*	:X:	:	** :X:	: ** : : : ** : : : *
16 T 13S R 12E SLBM	*	:	:	:	**X: : : ** :X: : ** : : : *

NATURE OF USE ----->

CHANGED as follows:

SUPPLEMENTAL to Other Water Rights: No  
SUPPLEMENTAL to Other Water Rights: No

IRR: 73.1000 acs Sol/Sup: acs USED 04/01 - 10/31

STK: 130.0000 Cattle or Equivalent USED 01/01 - 12/31

OTHER: Exploration Drilling USED 07/26 - 11/30

OTH:

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Select Related Information

**(WARNING: Water Rights makes NO claims as to the accuracy of this data.)** RUN DATE: 10/08/2007 Page 1

CHANGE: t25914

WATER RIGHT: 91-23 CERT. NO.:

AMENDATORY? No

BASE WATER RIGHTS: 91-23

RIGHT EVIDENCED BY: 91023, 491 (A5039) Cert. #1685

CHANGES: Point of Diversion [X], Place of Use [X], Nature of Use [X],  
Reservoir Storage [ ].

\*-----\*

NAME: Canyon Fuel Company LLC

ADDR: P.O. Box 1029

Wellington UT 84542

REMARKS:

\*-----\*

FILED: 08/20/2001|PRIORITY: 08/20/2001|ADV BEGAN: |ADV  
ENDED: |NEWSPAPER:  
ProtestEnd: |PROTESTED: [No ]|HEARNG HLD: |SE  
ACTION: [Approved]|ActionDate:08/24/2001|PROOF DUE:  
EXTENSION: |ELEC/PROOF:[ ]|ELEC/PROOF:  
|CERT/WUC: |LAP, ETC: 10/31/2001|LAPS LETTER:  
RUSH LETTR: |RENOVATE: |RECON REQ: |TYPE:  
[ ]

Status: Lapsed

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\*\*\*\*\*H E R E T O F O R E\*\*\*\*\*  
\*\*\*\*\*H E R E A F T E R\*\*\*\*\*  
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|FLOW: 2.5 acre-feet  
||FLOW: 2.5 acre-feet  
|-----|

|SOURCE: Dugout Canyon Creek  
||SOURCE: Pace Creek  
|COUNTY: Carbon  
||COUNTY: Carbon COM DESC: 2 mi. North of Clark's Valley  
|

|POINT(S) OF DIVERSION ----->

||CHANGED AS FOLLOWS: (Click Location link for WRPLAT)

```

Point Surface:
|Point Surface:
|(1) N 1260 ft E 120 ft from SW cor, Sec 03, T 14S, R 12E, SLBM| (1)
N 1150 ft W 950 ft from SE cor, Sec 19, T 13S, R 13E, SLBM|
| Dvrting Wks:
Dvrting Wks:
| Source:
Source:
|
| (2)
N 1150 ft E 1200 ft from SW cor, Sec 20, T 13S, R 13E, SLBM|
|
Dvrting Wks:
|
|
Source:
|
| (3)
S 150 ft E 1850 ft from NW cor, Sec 30, T 13S, R 13E, SLBM|
|
Dvrting Wks:
|
|
Source:
|
|
|Stream Alt?: No

```

PLACE OF USE -----&gt;

```

--NW%-- --NE%-- --SW%-- --SE%-- |
--NW%-- --NE%-- --SW%-- --SE%-- |
|NNSS|NNSS|NNSS|NNSS||
|NNSS|NNSS|NNSS|NNSS|
|WEWE|WEWE|WEWE|WEWE||
|WEWE|WEWE|WEWE|WEWE|
|
19 T 13S R 13E SLBM *X: : : ** : : : ** : : : ** : : : X*|
|
24 T 13S R 13E SLBM * : : : ** : : : **X: : : ** : : : *|
|
30 T 13S R 13E SLBM * :X: : ** : : : ** : : : ** : : : *|

```

NATURE OF USE - - - - ->

SUPPLEMENTAL to Other Water Rights: Yes  
 SUPPLEMENTAL to Other Water Rights: No

---

IRR: 605.7000 acs Sol/Sup: 293.4300 acs USED 04/01 - 09/30

STK: 810.0000 Cattle or Equivalent USED 04/01 - 09/30

OIL EXPLORATION: Exploratory Drilling USED 08/27 - 10/31

OTH:

---

RESERVOIR STORAGE --> SAME  
 AS HERETOFORE

---

Storage 03/01 to 07/31, in Clark's Valley Reservoir

with a maximum capacity of 460.500 acre-feet, located in:

--NW¼-- --NE¼-- --SW¼-- --SE¼--

Height of Dam: ft |N N S S| |N N S S| |N N S S| |N N S S|

Area Inundat acs |W E W E| |W E W E| |W E W E| |W E W E|

Sec 10 T 14S R 12E SLBM \* : : : \*\* : : : \*\* : : :X\*\* : :X: \*|

Sec 15 T 14S R 12E SLBM \* :X: : \*\*X: : : \*\* : : : \*\* : : : \*|

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Select Related Information

(WARNING: Water Rights makes NO claims as to the accuracy of this data.) RUN DATE: 10/08/2007 Page 1

CHANGE: t28162

WATER RIGHT: 91-519 CERT. NO.:

AMENDATORY? No

BASE WATER RIGHTS: 91-519

RIGHT EVIDENCED BY: 91-519

CHANGES: Point of Diversion [X], Place of Use [X], Nature of Use [X], Reservoir Storage [ ].

\*

\*

NAME: Canyon Fuel Company LLC

ADDR: 6955 Union Park Center Suite 550  
Midvale UT 84047

REMARKS:

\*

\*

FILED: 08/07/2003|PRIORITY: 08/07/2003|ADV BEGAN:

|ADV

ENDED: |NEWSPAPER:

ProtestEnd: |PROTESTED: [No ]|HEARNG HLD:

|SE

ACTION: [Approved]|ActionDate:08/07/2003|PROOF DUE:

EXTENSION: |ELEC/PROOF:[ ]|ELEC/PROOF:

|CERT/WUC: |LAP, ETC: 08/06/2004|LAPS LETTER:

RUSH LETTR: |RENOVATE: |RECON REQ:

|TYPE:

[ ]

Status: Lapsed

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\*\*\*\*\*HERE TO F O R E\*\*\*\*\*  
\*\*\*\*\*H E R E A F T E R\*\*\*\*\*  
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|FLOW: 2.5 acre-feet

||FLOW: 2.5 acre-feet

|

|SOURCE: Soldier Creek

||SOURCE: Dugout Canyon Creek

|

|COUNTY: Carbon

||COUNTY: Carbon COM DESC: 12 m. N. Hwy 6 Clark Valley

|

The water will be used for Dugout

Canyon Mine exploration drilling and dust

suppression.

POINT(S) OF DIVERSION ----->

CHANGED AS FOLLOWS: (Click Location link for WRPLAT)

Point Surface:

Point Surface:

(1) N 1040 ft E 740 ft from SW cor, Sec 19, T 13S, R 12E, SLBM (1)

N 1600 ft W 1325 ft from SE cor, Sec 13, T 13S, R 12E, SLBM

Dvrting Wks:

Dvrting Wks: Portable pump & tank truck

Source:

Source: Dugout Canyon Creek

N 1850 ft W 1120 ft from SE cor, Sec 13, T 13S, R 12E, SLBM

Dvrting Wks: Portable pump & tank truck

Source: Dugout Canyon Creek

Stream Alt?: No

PLACE OF USE ----->

CHANGED as follows:

--NW¼-- --NE¼-- --SW¼-- --SE¼--  
--NW¼-- --NE¼-- --SW¼-- --SE¼--

|N N S S|N N S S|N N S S|N N S S|

|N N S S|N N S S|N N S S|N N S S|

|W E W E|W E W E|W E W E|W E W E|

|W E W E|W E W E|W E W E|W E W E|

|Sec 25 T 13S R 11E SLBM \* : : : \*\* : : : \*\* :X: :X\*|Sec

13 T 13S R 12E SLBM \* : : : \*\* : : : \*\* :X:X:X: \*

|Sec 30 T 13S R 12E SLBM \* : : : \*\* : : : \*\* :X: \*\* : : \*|Sec

18 T 13S R 13E SLBM \* : : : \*\* : : : \*\* :X: \*



NATURE OF USE ----->		
CHANGED as follows:		
-----		
SUPPLEMENTAL to Other Water Rights: Yes		
SUPPLEMENTAL to Other Water Rights: No		
-----		
IRR:	73.1000 acs Sol/Sup:	acs USED 04/01 - 10/31
.....		
STK:	130.0000 Cattle or Equivalent	USED 01/01 - 12/31
.....		
OTHER: Exploration drilling		USED 08/07 - 08/06
and dust suppression		
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Select Related Information

(WARNING: Water Rights makes NO claims as to the accuracy of this data.) RUN DATE: 10/08/2007 Page 1

CHANGE: a27255

WATER RIGHT: 91-4987 CERT. NO.:

AMENDATORY? No

BASE WATER RIGHTS: 91-4987

RIGHT EVIDENCED BY: 91-4987

CHANGES: Point of Diversion [X], Place of Use [ ], Nature of Use [ ], Reservoir Storage [ ].

-----\*

NAME: Canyon Fuel Company LLC

ADDR: City Place One Suite 300

St. Louis MO 63141

REMARKS:

-----\*

FILED: 11/14/2002|PRIORITY: 11/14/2002|ADV BEGAN: 12/05/2002|ADV

ENDED: 12/12/2002|NEWSPAPER: Sun Advocate

ProtestEnd:01/01/2003|PROTESTED: [No ]|HEARNG HLD: |SE

ACTION: [ ]|ActionDate: |PROOF DUE:

EXTENSION: |ELEC/PROOF:[ ]|ELEC/PROOF:

|CERT/WUC: |LAP, ETC: |LAPS LETTER:

RUSH LETTR: |RENOVATE: |RECON REQ: |TYPE:

[ ]

Status: Terminated

\*\*\*\*\*  
\*\*\*\*\*  
\*\*\*\*\*HERE TO FORE\*\*\*\*\*  
\*\*\*\*\*HERE A F T E R\*\*\*\*\*  
\*\*\*\*\*  
\*\*\*\*\*

|FLOW: 250.0 acre-feet

|FLOW: 250.0 acre-feet

-----|

|SOURCE: Dugout Canyon Creek

|SOURCE: Underground Water Well (Existing)

-----|

|COUNTY: Carbon

|COUNTY: Carbon COM DESC:

-----|

|  
The purpose of this application is to

change the point of diversion from			
Dugout Canyon Creek to the existing			
well covered by water right 91-5024.			
-----			
-----			

POINT(S) OF DIVERSION ----->			
CHANGED AS FOLLOWS: (Click Location link for WRPLAT)			
-----			
Point Surface:			
(1) N 3360 ft E 1860 ft from SW cor, Sec 23, T 13S, R 12E, SLBM			
Dvrting Wks:			
Source:			
-----			
Point Underground:			
UNDERGROUND: (Click Link for PLAT data, Well ID# link for data.)			(1)
S 125 ft E 2307 ft from NW cor, Sec 23, T 13S, R 12E, SLBM			
Diameter: 10 ins. Depth: 300 to ft. WELL ID#:			
COMMENT: Existing Well			
-----			
-----			

PLACE OF USE ----->				SAME
AS HERETOFORE				
-----				
-----				
	--NW¼--	--NE¼--	--SW¼--	--SE¼--
	N N S S	N N S S	N N S S	N N S S
	W E W E	W E W E	W E W E	W E W E
Sec 09 T 13S R 12E SLBM	* : : : *	* : : : *	* : : : *	* : : : *
Sec 10 T 13S R 12E SLBM	* : : : *	* : : : *	* : : : *	* : : : *
Sec 11 T 13S R 12E SLBM	* : : : *	* : : : *	* : : : *	* : : : *

Sec 14 T 13S R 12E SLBM	*X:X:X:X**X:X:X:X**X:X:X:X**X:X:X:X*
Sec 15 T 13S R 12E SLBM	*X:X:X:X**X:X:X:X**X:X:X:X**X:X:X:X*
Sec 16 T 13S R 12E SLBM	*X:X:X:X**X:X:X:X**X:X:X:X**X:X:X:X*
Sec 17 T 13S R 12E SLBM	* : : : ** : : : ** :X: :X**X:X:X:X*
Sec 20 T 13S R 12E SLBM	* :X:X:X**X:X: : ** : : : ** : : : *
Sec 21 T 13S R 12E SLBM	*X:X: : **X:X:X:X** : : : ** : : : *
Sec 22 T 13S R 12E SLBM	*X:X:X:X**X:X:X:X**X:X: : **X:X: : *
Sec 23 T 13S R 12E SLBM	*X:X:X:X**X: :X: ** : : : ** : : : *

NATURE OF USE ----->		SAME
AS HERETOFORE		
-----		----
SUPPLEMENTAL to Other Water Rights: Yes		
SUPPLEMENTAL to Other Water Rights: No		
.....		....
MIN: District: Dugout Canyon		USED 01/01 - 12/31
Name:	Dugout Canyon	
Ores:	Coal	
-----		----
.....		....
OTH: OTHER: dust suppression and		USED 01/01 - 12/31
fire protection		
-----		----

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Select Related Information

(WARNING: Water Rights makes NO claims as to the accuracy of this data.) RUN DATE: 10/08/2007 Page 1

CHANGE: t29158

WATER RIGHT: 91-409 CERT. NO.:

AMENDATORY? No

BASE WATER RIGHTS: 91-409

RIGHT EVIDENCED BY: 91-409 (A9502) Cert. No. 2207

CHANGES: Point of Diversion [X], Place of Use [X], Nature of Use [X], Reservoir Storage [ ].

NAME: Canyon Fuel Company

ADDR: HC 35 Box 380

Helper, Utah 84526

INTEREST: 100%

REMARKS:

FILED: 07/01/2004|PRIORITY: 07/01/2004|ADV BEGAN: |ADV

ENDED: |NEWSPAPER:

ProtestEnd: |PROTESTED: [No ]|HEARNG HLD: |SE

ACTION: [Approved]|ActionDate:07/02/2004|PROOF DUE:

EXTENSION: |ELEC/PROOF:[ ]|ELEC/PROOF:

|CERT/WUC: |LAP, ETC: 07/01/2005|LAPS LETTER:

RUSH LETTR: |RENOVATE: |RECON REQ: |TYPE:

[ ]

Status: Lapsed

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\*\*\*\*\*  
\*\*\*\*\*HERE TO F O R E\*\*\*\*\*  
\*\*\*\*\*H E R E A F T E R\*\*\*\*\*  
\*\*\*\*\*  
\*\*\*\*\*

|FLOW: 3.0 acre-feet

||FLOW: 3.0 acre-feet

|SOURCE: Pace Canyon Creek

||SOURCE: Pace Canyon Creek

|COUNTY: Carbon

||COUNTY: Carbon COM DESC: 11 mi. No. Hwy 6-Clark Valley

The water will be used for Dugout

Canyon Mine exploration drilling and dust  
suppression.

POINT(S) OF DIVERSION ----->

CHANGED AS FOLLOWS: (Click Location link for WRPLAT)

Point Surface:

Point Surface:

(1) N 1280 ft W 1200 ft from SE cor, Sec 03, T 14S, R 12E, SLBM (1)  
N 1090 ft W 950 ft from SE cor, Sec 19, T 13S, R 13E, SLBM

Dvrting Wks:

Dvrting Wks: Portable pump and tank truck

Source:

Source: Pace Canyon Creek

N 1735 ft W 850 ft from NE cor, Sec 19, T 13S, R 13E, SLBM

Dvrting Wks: Portable pump and tank truck

Source: Pace Canyon Creek

N 1160 ft E 1140 ft from SW cor, Sec 20, T 13S, R 13E, SLBM

Dvrting Wks: Portable pump and tank truck

Source: Pace Canyon Creek

N 2320 ft W 2230 ft from SE cor, Sec 20, T 13S, R 13E, SLBM

Dvrting Wks: Portable pump and tank truck

Source: Pace Canyon Creek

Stream Alt?: No

PLACE OF USE ----->

CHANGED as follows:

	--NW¼--	--NE¼--	--SW¼--	--SE¼--	
	N N S S	N N S S	N N S S	N N S S	
	W E W E	W E W E	W E W E	W E W E	
Sec 09 T 14S R 12E SLBM	* : : *	* : : *	* : : *	* : : *	Sec
13 T 13S R 12E SLBM	* : : *	* : : *	* : : *	* : : *	
Sec 10 T 14S R 12E SLBM	* : X : X :	* : X : X :	* : X : X :	* : X : X :	Sec
24 T 13S R 12E SLBM	* : : *	* : : *	* : : *	* : : *	
Sec 15 T 14S R 12E SLBM	* : X : X :	* : X : X :	* : X : X :	* : X : X :	Sec
18 T 13S R 13E SLBM	* : : *	* : : *	* : : *	* : : *	
Sec 22 T 14S R 12E SLBM	* X : X : X :	* : : *	* : : *	* : : *	Sec
19 T 13S R 13E SLBM	* : : *	* : : *	* : : *	* : : *	
20 T 13S R 13E SLBM	* : : *	* : : *	* : : *	* : : *	Sec

NATURE OF USE ----->

CHANGED as follows:

SUPPLEMENTAL to Other Water Rights: Yes

SUPPLEMENTAL to Other Water Rights: No

IRR: 645.8000 acs Sol/Sup: 121.3500 acs USED 04/01 - 10/01

STK: 810.0000 Cattle or Equivalent USED 04/01 - 10/01

OTHER: Exploration drilling USED 07/02 - 07/01

and dust suppression

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Select Related Information

(WARNING: Water Rights makes NO claims as to the accuracy of this data.) RUN DATE: 10/08/2007 Page 1

CHANGE: t30602

WATER RIGHT: 91-409 CERT. NO.:

AMENDATORY? No

BASE WATER RIGHTS: 91-409

RIGHT EVIDENCED BY: 91-409(A9502) Cert. No. 227

Prior approved Temporary Change Applications for

this right: t27967; t28160; t29158

CHANGES: Point of Diversion [X], Place of Use [X], Nature of Use [X], Reservoir Storage [X].

★

★

NAME: Canyon Fuel Company LLC

ADDR: Attn: Property Administration

CityPlace One Suite 300

St. Louis MO 63141

INTEREST: 100%

REMARKS: c/o Ark Land Company

★

★

FILED: 08/31/2005|PRIORITY: 08/31/2005|ADV BEGAN: |ADV

ENDED: |NEWSPAPER:

ProtestEnd: |PROTESTED: [No ]|HEARNG HLD: |SE

ACTION: [Approved]|ActionDate:08/31/2005|PROOF DUE:

EXTENSION: |ELEC/PROOF:[ ]|ELEC/PROOF:

|CERT/WUC: |LAP, ETC: 08/30/2006|LAPS LETTER:

RUSH LETTR: |RENOVATE: |RECON REQ: |TYPE:

[ ]

Status: Lapsed

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\*\*\*\*\*H E R E T O F O R E\*\*\*\*\*

\*\*\*\*\*H E R E A F T E R\*\*\*\*\*

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|FLOW: 5.0 acre-feet

||FLOW: 5.0 acre-feet

|SOURCE: Pace Canyon Creek

||SOURCE: Pace Canyon Creek

|COUNTY: Carbon

||COUNTY: Carbon COM DESC: 15 Miles NE of Wellington

Pine Canyon Quad

POD - DIVERTING WORKS: Portable pump  
and tank truck

The water will be used for Dugout  
Canyon Mine exploration drilling and dust  
suppression.

POINT(S) OF DIVERSION ----->

CHANGED AS FOLLOWS: (Click Location link for WRPLAT)

Point Surface:

Point Surface:

(1) N 1280 ft W 1200 ft from SE cor, Sec 03, T 14S, R 12E, SLBM (1)  
N 3475 ft W 845 ft from SE cor, Sec 19, T 13S, R 13E, SLBM

Dvrting Wks:

Dvrting Wks:

Source:

Source:

N 2280 ft W 1300 ft from SE cor, Sec 19, T 13S, R 13E, SLBM

Dvrting Wks:

Source:

N 1050 ft W 890 ft from SE cor, Sec 20, T 13S, R 13E, SLBM

Dvrting Wks:

Source:

| (4)  
N 1075 ft E 2560 ft from SW cor, Sec 20, T 13S, R 13E, SLBM|  
|  
Dvrting Wks: |  
|  
Source: |  
|  
|  
Stream Alt?: No
-----

PLACE OF USE ----->  
CHANGED as follows:
-----
NW NE SW SE
NW NE SW SE
N N S S
N N S S
W E W E
W E W E
Sec 09 T 14S R 12E SLBM \* : : : \*\* : : : \*\* : : : \*\* :X:X:X\*
17 T 13S R 13E SLBM \* : : : \*\* : : : \*\* : : : \*\* :X: \*
Sec 10 T 14S R 12E SLBM \* :X:X: \*\*X: :X: \*\*X:X:X:X\*\* : : : \*
18 T 13S R 13E SLBM \* : : : \*\* : : : \*\* : : : \*\* : : :X\*
Sec 15 T 14S R 12E SLBM \* :X: :X\*\* : :X: \*\* :X:X:X\*\*X: :X: \*
19 T 13S R 13E SLBM \* : : \*\* : : : \*\* : : : \*\* :X: : \*
Sec 22 T 14S R 12E SLBM \*X:X:X:X\*\* : : : \*\* : : : \*\* : : : \*
20 T 13S R 13E SLBM \* : : : \*\* : : : \*\*X: : :X\*\* :X: : \*
21 T 13S R 13E SLBM \* : : : \*\* : : : \*\*X: : : \*\* : : : \* |

NATURE OF USE ----->  
CHANGED as follows:
SUPPLEMENTAL to Other Water Rights: Yes
SUPPLEMENTAL to Other Water Rights: No
-----
IRR: 645.8000 acs Sol/Sup: 121.3500 acs USED 04/01 - 10/01
.....
.....
STK: 810.0000 Cattle or Equivalent USED 04/01 - 10/01
.....
.....





Select Related Information

**(WARNING: Water Rights makes NO claims as to the accuracy of this data.)** RUN DATE: 10/08/2007 Page 1

CHANGE: t31206

WATER RIGHT: 91-409 CERT. NO.:

AMENDATORY? No

BASE WATER RIGHTS: 91-409

RIGHT EVIDENCED BY: 91-409(A9502) Cert. No. 2207

CHANGES: Point of Diversion [X], Place of Use [X], Nature of Use [X],  
Reservoir Storage [ ].

\*\*\*\*\*

NAME: Canyon Fuel Company LLC  
ADDR: Attn: Property Administration  
CityPlace One Suite 300  
St. Louis MO 63141

INTEREST: 100% REMARKS: c/o Ark Land Company

\*\*\*\*\*

FILED: 03/20/2006|PRIORITY: 03/20/2006|ADV BEGAN: |ADV  
ENDED: |NEWSPAPER:  
ProtestEnd: |PROTESTED: [No ]|HEARNG HLD: |SE  
ACTION: [Approved]|ActionDate:03/23/2006|PROOF DUE:  
EXTENSION: |ELEC/PROOF:[ ]|ELEC/PROOF:  
|CERT/WUC: |LAP, ETC: 03/31/2007|LAPS LETTER:  
RUSH LETTR: |RENOVATE: |RECON REQ: |TYPE:  
[ ]

Status: Lapsed

\*\*\*\*\*  
\*\*\*\*\*  
\*\*\*\*\*HERE TO F O R E\*\*\*\*\*  
\*\*\*\*\*H E R E A F T E R\*\*\*\*\*  
\*\*\*\*\*  
\*\*\*\*\*

|FLOW: 9.0 acre-feet  
||FLOW: 9.0 acre-feet

|SOURCE: Pace Canyon Creek  
||SOURCE: Pace Canyon Creek

|COUNTY: Carbon  
||COUNTY: Carbon COM DESC: 11 Miles NW of Sunnyside

The water will be used for Dugout

Canyon Mine exploration drilling and dust  
suppression.

Diverting Works: Portable pump & tank  
trucks.

---

POINT(S) OF DIVERSION ----->

CHANGED AS FOLLOWS: (Click Location link for WRPLAT)

---

Point Surface:

Point Surface:

(1) N 1280 ft W 1200 ft from SE cor, Sec 03, T 14S, R 12E, SLBM | (1)  
N 1070 ft W 1100 ft from SE cor, Sec 19, T 13S, R 13E, SLBM |

Dvrting Wks:

Dvrting Wks:

Source:

Source:

N 3500 ft W 850 ft from SE cor, Sec 19, T 13S, R 13E, SLBM | (2)

Dvrting Wks:

Source:

N 1325 ft E 1400 ft from SW cor, Sec 20, T 13S, R 13E, SLBM | (3)

Dvrting Wks:

Source:

N 1060 ft E 2590 ft from SW cor, Sec 20, T 13S, R 13E, SLBM | (4)

Dvrting Wks:

Source:

N 1070 ft W 900 ft from SE cor, Sec 20, T 13S, R 13E, SLBM | (5)

Dvrting Wks:

Source:

N 700 ft E 1970 ft from SW cor, Sec 21, T 13S, R 13E, SLBM | (6)

Dvrting Wks:

Source:

N 1400 ft W 960 ft from SE cor, Sec 21, T 13S, R 13E, SLBM

Dvrting Wks:

Source:

Stream Alt?: No

PLACE OF USE ----->

CHANGED as follows:

	--NW¼--	--NE¼--	--SW¼--	--SE¼--	
	N N S S	N N S S	N N S S	N N S S	
	W E W E	W E W E	W E W E	W E W E	
Sec 09 T 14S R 12E SLBM	* : : *	: : *	: : *	: : X** : X	: X*   Sec
17 T 13S R 13E SLBM	* : : *	: : *	: : *	: : X	: *
Sec 10 T 14S R 12E SLBM	* : X:X	: **X	: X	: **X:X:X:X**	: : *   Sec
19 T 13S R 13E SLBM	* : : *	: : *	: : *	: : X	: *
Sec 15 T 14S R 12E SLBM	* : X:X	: **	: X	: ** : X	: X**X : X : *   Sec
20 T 13S R 13E SLBM	* : : *	: : *	: : **X	: : X** : X	: *
Sec 22 T 14S R 12E SLBM	* X:X:X:X**	: : *	: : *	: : *	: : *   Sec
21 T 13S R 13E SLBM	* : : *	: : *	: : **X	: : *	: : *

NATURE OF USE ----->

CHANGED as follows:

SUPPLEMENTAL to Other Water Rights: Yes

SUPPLEMENTAL to Other Water Rights: No

IRR: 645.8000 acs Sol/Sup: 121.3500 acs USED 04/01 - 10/01

STK: 810.0000 Cattle or Equivalent

USED 04/01 - 10/01

| .....| | .....  
| .....|  
| .....| |OTH:  
OTHER: Exploration drilling USED 04/01 - 04/01|  
| .....|  
and dust supression|  
| .....|  
| .....|

---

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\*\*\*\*\*E N D O F D  
A T A\*\*\*\*\*  
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Select Related Information

**(WARNING: Water Rights makes NO claims as to the accuracy of this data.)** RUN DATE: 10/08/2007 Page 1

CHANGE: t32919

WATER RIGHT: 91-409 CERT. NO.:

AMENDATORY? No

BASE WATER RIGHTS: 91-409

RIGHT EVIDENCED BY: 91-409(A9502)

CHANGES: Point of Diversion [X], Place of Use [X], Nature of Use [X],  
Reservoir Storage [ ].

\*-----\*

NAME: Canyon Fuel Company LLC

ADDR: Attn: Property Administration

CityPlace One Suite 300

St. Louis MO 63141

INTEREST: 100%

REMARKS: c/o Ark Land Company

\*-----\*

FILED: 04/26/2007|PRIORITY: 04/26/2007|ADV BEGAN: |ADV

ENDED: |NEWSPAPER: No Adv Required

ProtestEnd: |PROTESTED: [No ]|HEARNG HLD: |SE

ACTION: [Approved]|ActionDate:05/01/2007|PROOF DUE:

EXTENSION: |ELEC/PROOF:[ ]|ELEC/PROOF:

|CERT/WUC: |LAP, ETC: 05/01/2008|LAPS LETTER:

RUSH LETTR: |RENOVATE: |RECON REQ: |TYPE:

[ ]

Status: Approved

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\*\*\*\*\*H E R E T O F O R E\*\*\*\*\*

\*\*\*\*\*H E R E A F T E R\*\*\*\*\*

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\*\*\*\*\*

|FLOW: 12.0 acre-feet

||FLOW: 12.0 acre-feet

|-----|

|SOURCE: Pace Canyon Creek

||SOURCE: Pace Canyon Creek

|-----|

|COUNTY: Carbon

||COUNTY: Carbon COM DESC: 11 Miles NE of Wellington

|-----|

Additional Place of Use:

Sections 16, 17, 18, 19, 20, 21, and  
30 of T13S, R13E, SLB&M.

In addition to normal mining  
activities, the applicant seeks to use water for  
a drilling program incidental to coal  
mining including dust suppression, fire  
protection, and coal processing.

POINT(S) OF DIVERSION -----> | SAME  
AS HERETOFORE, AND IN ADDITION TO: (Click link for WRPLAT) |

Point Surface:  
Point Surface:  
(1) N 1280 ft W 1200 ft from SE cor, Sec 03, T 14S, R 12E, SLBM | (1)  
N 1070 ft W 1100 ft from SE cor, Sec 19, T 13S, R 13E, SLBM |  
Dvrting Wks: |  
Dvrting Wks: |  
Source: |  
Source: | (2)  
N 3500 ft W 850 ft from SE cor, Sec 19, T 13S, R 13E, SLBM |  
Dvrting Wks: |  
Source: |  
N 1325 ft E 1400 ft from SW cor, Sec 20, T 13S, R 13E, SLBM | (3)  
Dvrting Wks: |  
Source: |  
N 1070 ft W 900 ft from SE cor, Sec 20, T 13S, R 13E, SLBM | (4)

	Dvrting Wks:		
	Source:		
	N 1060 ft E 2590 ft from SW cor, Sec 20, T 13S, R 13E, SLBM		(5)
	Dvrting Wks:		
	Source:		
	N 1400 ft W 960 ft from SE cor, Sec 21, T 13S, R 13E, SLBM		(6)
	Dvrting Wks:		
	Source:		
	S 1011 ft E 1322 ft from NW cor, Sec 30, T 13S, R 13E, SLBM		(7)
	Dvrting Wks:		
	Source:		
	Stream Alt?: No		

	PLACE OF USE ----->		SAME
	AS HERETOFORE, AND IN ADDITION TO:		
	-----		-----
	-----		-----
	--NW¼-- --NE¼-- --SW¼-- --SE¼--   --NW¼-- --NE¼-- --SW¼-- --SE¼--    N N S S N N S S N N S S N N S S    N N S S N N S S N N S S N N S S   W E W E W E W E W E W E W E W E    W E W E W E W E W E W E W E W E		
	17 T 13S R 13E SLBM * : : : ** : : : **X:X:X:X** : : : *		Sec
	18 T 13S R 13E SLBM * : : : ** : : : ** : : : **X:X:X:X*		Sec
	19 T 13S R 13E SLBM * : : : **X:X:X:X** : : : **X:X:X:X*		Sec
	20 T 13S R 13E SLBM *X:X:X:X**X:X:X:X**X:X:X:X**X:X:X:X*		Sec
	21 T 13S R 13E SLBM *X:X:X:X** : : : **X:X:X:X** : : : *		Sec

NATURE OF USE ----->			SAME
AS HERETOFORE, AND IN ADDITION TO:			
-----			----
SUPPLEMENTAL to Other Water Rights: Yes			
SUPPLEMENTAL to Other Water Rights: No			
.....			.....
.....			
INDUSTRIAL:           Dust Suppression,           USED 05/15 - 10/31			OTH:
Fire protection, & coal processing.			
-----			----
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Canyon Fuel Company, LLC  
SCM/Dugout Canyon Mine

Mining and Reclamation Plan  
October 15, 2007 ~~September 18, 2007~~

## **APPENDIX 7-2**

### **Groundwater Monitoring Data**

SPRINGS 321 and 322

"321" Monitoring Data 2007

Date	Time	pH	Cond.	Temp.	Flow (gpm)	Comments
3/15/07	1220				NOA	Snow/Ice
5/18/07	1420	8.08	406	4	1.5	
6/21/07	1114	8.11	410	7.6	1.3	
7/24/07	834	7.38	469	8.5	0.75	
8/30/07	1205	7.42	471	8	0.7	

"322" Monitoring Data 2007

Date	Time	pH	Cond.	Temp.	Flow (gpm)	Comments
3/15/07	1220				NOA	Snow/Ice
6/21/07	905	7.84	704	7	18	
7/24/07	916	7.91	698	9	0.2	Livestock
8/30/07	1130	7.91	663	11	0.1	Livestock

**Soldier Creek Coal Company**

Project ID:

Sample ID: 321

ACZ Sample ID: **L63413-01**

Date Sampled: 06/21/07 00:00

Date Received: 06/25/07

Sample Matrix: Ground Water

## Inorganic Prep

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Total Hot Plate Digestion	M200.2 ICP							06/27/07 19:18	erf

## Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Calcium, dissolved	M200.7 ICP	77.5			mg/L	0.2	1	07/03/07 13:37	msh
Iron, dissolved	M200.7 ICP		U		mg/L	0.02	0.05	07/03/07 13:37	msh
Iron, total	M200.7 ICP	1.59		*	mg/L	0.02	0.05	07/05/07 22:24	djt
Magnesium, dissolved	M200.7 ICP	22.5			mg/L	0.2	1	07/03/07 13:37	msh
Manganese, dissolved	M200.7 ICP		U		mg/L	0.005	0.03	07/03/07 13:37	msh
Manganese, total	M200.7 ICP	0.024	B		mg/L	0.005	0.03	07/05/07 22:24	djt
Potassium, dissolved	M200.7 ICP	1.0	B		mg/L	0.3	2	07/03/07 13:37	msh
Sodium, dissolved	M200.7 ICP	9.2			mg/L	0.3	2	07/03/07 13:37	msh

## Wet Chemistry

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO <sub>3</sub>	SM2320B - Titration								
Bicarbonate as CaCO <sub>3</sub>		270			mg/L	2	20	06/26/07 0:00	lcp/jlf
Carbonate as CaCO <sub>3</sub>			U		mg/L	2	20	06/26/07 0:00	lcp/jlf
Hydroxide as CaCO <sub>3</sub>			U		mg/L	2	20	06/26/07 0:00	lcp/jlf
Total Alkalinity		270			mg/L	2	20	06/26/07 0:00	lcp/jlf
Cation-Anion Balance	Calculation								
Cation-Anion Balance		6.1			%			07/10/07 15:15	calc
Sum of Anions		5.4			meq/L	0.1	0.5	07/10/07 15:15	calc
Sum of Cations		6.1			meq/L	0.1	0.5	07/10/07 15:15	calc
Chloride	325.2 / SM4500Cl-E	3	B	*	mg/L	1	5	07/02/07 15:00	aml/jag
Residue, Filterable (TDS) @180C	160.1 / SM2540C	290			mg/L	10	20	06/28/07 15:50	jlf
Sulfate	SM4500 SO <sub>4</sub> -D		U	*	mg/L	10	50	07/03/07 9:20	aeh
TDS (calculated)	Calculation	275			mg/L	10	50	07/10/07 15:15	calc
TDS (ratio - measured/calculated)	Calculation	1.05						07/10/07 15:15	calc



**Soldier Creek Coal Company**

Project ID:

Sample ID: 321

ACZ Sample ID: **L64797-01**

Date Sampled: 08/30/07 12:05

Date Received: 09/04/07

Sample Matrix: Ground Water

**Inorganic Prep**

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Total Hot Plate Digestion	M200.2 ICP							09/05/07 14:15	bjl

**Metals Analysis**

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Calcium, dissolved	M200.7 ICP	75.9			mg/L	0.2	1	09/06/07 3:00	djt
Iron, dissolved	M200.7 ICP	0.03	B		mg/L	0.02	0.05	09/06/07 3:00	djt
Iron, total	M200.7 ICP	0.24			mg/L	0.02	0.05	09/06/07 20:31	erf
Magnesium, dissolved	M200.7 ICP	22.1			mg/L	0.2	1	09/06/07 3:00	djt
Manganese, dissolved	M200.7 ICP	0.014	B		mg/L	0.005	0.03	09/06/07 3:00	djt
Manganese, total	M200.7 ICP	0.007	B		mg/L	0.005	0.03	09/06/07 20:31	erf
Potassium, dissolved	M200.7 ICP	1.1	B		mg/L	0.3	2	09/06/07 3:00	djt
Sodium, dissolved	M200.7 ICP	10.0			mg/L	0.3	2	09/06/07 3:00	djt

**Wet Chemistry**

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO <sub>3</sub>	SM2320B - Titration								
Bicarbonate as CaCO <sub>3</sub>		274			mg/L	2	20	09/06/07 0:00	lcp
Carbonate as CaCO <sub>3</sub>			U		mg/L	2	20	09/06/07 0:00	lcp
Hydroxide as CaCO <sub>3</sub>			U		mg/L	2	20	09/06/07 0:00	lcp
Total Alkalinity		274			mg/L	2	20	09/06/07 0:00	lcp
Cation-Anion Balance	Calculation								
Cation-Anion Balance		4.3			%			09/17/07 0:00	calc
Sum of Anions		5.5			meq/L	0.1	0.5	09/17/07 0:00	calc
Sum of Cations		6.0			meq/L	0.1	0.5	09/17/07 0:00	calc
Chloride	325.2 / SM4500Cl-E	2	B	*	mg/L	1	5	09/10/07 12:59	mls
Residue, Filterable (TDS) @180C	160.1 / SM2540C	290			mg/L	10	20	09/04/07 16:22	lcp
Sulfate	SM4500 SO <sub>4</sub> -D		U		mg/L	10	50	09/05/07 9:14	aeh
TDS (calculated)	Calculation	276			mg/L	10	50	09/17/07 0:00	calc
TDS (ratio - measured/calculated)	Calculation	1.05						09/17/07 0:00	calc

**Soldier Creek Coal Company**

Project ID:

Sample ID: 322

ACZ Sample ID: **L64797-02**

Date Sampled: 08/30/07 11:30

Date Received: 09/04/07

Sample Matrix: Ground Water

## Inorganic Prep

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Total Hot Plate Digestion	M200.2 ICP							09/05/07 15:10	bjl

## Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Calcium, dissolved	M200.7 ICP	91.6			mg/L	0.2	1	09/06/07 3:04	djt
Iron, dissolved	M200.7 ICP		U		mg/L	0.02	0.05	09/06/07 3:04	djt
Iron, total	M200.7 ICP	8.27			mg/L	0.02	0.05	09/06/07 20:35	erf
Magnesium, dissolved	M200.7 ICP	41.3			mg/L	0.2	1	09/06/07 3:04	djt
Manganese, dissolved	M200.7 ICP	0.014	B		mg/L	0.005	0.03	09/06/07 3:04	djt
Manganese, total	M200.7 ICP	0.512			mg/L	0.005	0.03	09/06/07 20:35	erf
Potassium, dissolved	M200.7 ICP	1.5	B		mg/L	0.3	2	09/06/07 3:04	djt
Sodium, dissolved	M200.7 ICP	25.7			mg/L	0.3	2	09/06/07 3:04	djt

## Wet Chemistry

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO <sub>3</sub>	SM2320B - Titration								
Bicarbonate as CaCO <sub>3</sub>		390			mg/L	2	20	09/06/07 0:00	lcp
Carbonate as CaCO <sub>3</sub>		6	B		mg/L	2	20	09/06/07 0:00	lcp
Hydroxide as CaCO <sub>3</sub>			U		mg/L	2	20	09/06/07 0:00	lcp
Total Alkalinity		396			mg/L	2	20	09/06/07 0:00	lcp
Cation-Anion Balance	Calculation								
Cation-Anion Balance		2.8			%			09/17/07 0:00	calc
Sum of Anions		8.6			meq/L	0.1	0.5	09/17/07 0:00	calc
Sum of Cations		9.1			meq/L	0.1	0.5	09/17/07 0:00	calc
Chloride	325.2 / SM4500Cl-E	2	B	*	mg/L	1	5	09/10/07 13:01	mls
Residue, Filterable (TDS) @180C	160.1 / SM2540C	430			mg/L	10	20	09/04/07 16:23	lcp
Sulfate	SM4500 SO <sub>4</sub> -D	30	B		mg/L	10	50	09/05/07 9:19	aeh
TDS (calculated)	Calculation	432			mg/L	10	50	09/17/07 0:00	calc
TDS (ratio - measured/calculated)	Calculation	1.00						09/17/07 0:00	calc

# ACZ Laboratories, Inc.

2773 Downhill Drive Steamboat Springs, CO 80487(800) 334-5493

## Inorganic Analytical Results

### Soldier Creek Coal Company

Project ID:

Sample ID: 322

ACZ Sample ID: **L63413-02**

Date Sampled: 06/21/07 00:00

Date Received: 06/25/07

Sample Matrix: Ground Water

#### Inorganic Prep

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Total Hot Plate Digestion	M200.2 ICP							06/27/07 19:30	erf

#### Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Calcium, dissolved	M200.7 ICP	91.4			mg/L	0.2	1	07/03/07 13:40	msh
Iron, dissolved	M200.7 ICP		U		mg/L	0.02	0.05	07/03/07 13:40	msh
Iron, total	M200.7 ICP	0.69		*	mg/L	0.02	0.05	07/05/07 22:28	djt
Magnesium, dissolved	M200.7 ICP	43.8			mg/L	0.2	1	07/03/07 13:40	msh
Manganese, dissolved	M200.7 ICP	0.018	B		mg/L	0.005	0.03	07/03/07 13:40	msh
Manganese, total	M200.7 ICP	0.040			mg/L	0.005	0.03	07/05/07 22:28	djt
Potassium, dissolved	M200.7 ICP	1.5	B		mg/L	0.3	2	07/03/07 13:40	msh
Sodium, dissolved	M200.7 ICP	24.5			mg/L	0.3	2	07/03/07 13:40	msh

#### Wet Chemistry

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO <sub>3</sub>	SM2320B - Titration								
Bicarbonate as CaCO <sub>3</sub>		380			mg/L	2	20	06/26/07 0:00	lcp/jlf
Carbonate as CaCO <sub>3</sub>			U		mg/L	2	20	06/26/07 0:00	lcp/jlf
Hydroxide as CaCO <sub>3</sub>			U		mg/L	2	20	06/26/07 0:00	lcp/jlf
Total Alkalinity		380			mg/L	2	20	06/26/07 0:00	lcp/jlf
Cation-Anion Balance	Calculation								
Cation-Anion Balance		5.1			%			07/10/07 15:15	calc
Sum of Anions		8.3			meq/L	0.1	0.5	07/10/07 15:15	calc
Sum of Cations		9.2			meq/L	0.1	0.5	07/10/07 15:15	calc
Chloride	325.2 / SM4500Cl-E	3	B	*	mg/L	1	5	07/02/07 15:02	aml/jag
Residue, Filterable (TDS) @180C	160.1 / SM2540C	420			mg/L	10	20	06/28/07 15:52	jlf
Sulfate	SM4500 SO <sub>4</sub> -D	30	B	*	mg/L	10	50	07/03/07 9:23	aeh
TDS (calculated)	Calculation	422			mg/L	10	50	07/10/07 15:15	calc
TDS (ratio - measured/calculated)	Calculation	1.00						07/10/07 15:15	calc

Canyon Fuel Company, LLC  
SCM/Dugout Canyon Mine

Mining and Reclamation Plan  
October 15, 2007 ~~September 18, 2007~~

### **APPENDIX 7-3**

Mayo and Associates Report

**UPDATE TO THE PROBABLE HYDROLOGIC CONSEQUENCES  
OF COAL MINING AT THE DUGOUT CANYON MINE**

**OCTOBER 2007**

**UPDATE TO THE PROBABLE HYDROLOGIC CONSEQUENCES  
OF COAL MINING AT THE DUGOUT CANYON MINE**

**OCTOBER 2007**

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## **ATTACHMENTS**

### **Attachment 1**

PHC Update Figure 1  
Table 1 600 Acre Baseline Spring Field Data  
Baseline Water Quality Data for Springs 321 and 322

### **Attachment 2**

Palmer Hydrologic Drought Index, Region 6 and 7, 1991-2006  
Spring Flow Graphs for Dugout Canyon Mine Sites

### **Attachment 3**

Palmer Hydrologic Drought Index, Region 6 and 7, 1991-2006  
Well Water Level Graphs for Dugout Canyon Mine

### **Attachment 4**

Palmer Hydrologic Drought Index, Region 6 and 7, 1991-2006  
Surface Water Flow Graphs for Dugout Canyon Mine Sites

## **1.0 INTRODUCTION**

This addition to the Dugout Canyon Mine (Dugout) PHC is being prepared in conjunction with expansion of the mine permit area to include approximately 600 additional acres to the northeastern portion of the permit area. This addition includes updates to the surface and ground water monitoring plan, updated flow and water quality information for selected monitoring sites, additional monitoring sites, and the probable hydrologic impacts of mining to the approximate 600 acres of added permit area. This addition to the PHC does not address all sections of the existing PHC, rather only those sections that either need updating with current information and are pertinent to the Dugout Mine or sections that include new data. While all sections of the existing PHC are listed in the text of this addition, the sections not changed are indicated by the text "No Changes Made".

## **2.0 ANALYSIS OF SURFACE AND GROUNDWATER SYSTEMS**

### **2.1 STUDY AREA**

Section 12 of T13S R13E and Sections 16, 17, 18, and 21 of T13S R13E have been added to the study area as a result of permit area expansion. Portions of the drainage areas that intersect these sections have also been added to the study area (PHC Update Figure 1). The addition to the study area includes portions of the headwaters of Pace and Dugout Canyons as well as a small portion of the headwaters of Cow Canyon, a tributary to Nine Mile Canyon. The expanded area lies almost exclusively within the exposed Tertiary-age Colton Formation.

### **2.2 METHODS OF INVESTIGATION**

Methods similar to the initial PHC investigation have been employed to determine possible hydrologic consequences due to mining the 600 acre expansion and in the updating of the existing Dugout Mine portion of the PHC. Also, measured flow and selected chemistry parameters have been reviewed for existing Dugout Mine monitoring sites to determine what, if any, impacts have occurred to surface and ground water resources. Baseline field data have been collected from surface and ground water sites in the expansion area and new monitoring sites have been selected to be added to the permit water monitoring schedule. Water quality samples have been obtained and analyzed for these selected sites.

### **2.3 DESCRIPTION OF DATA**

The 600 acre expansion sample locations are identified on PHC Update Figure 1 and tables listing the measured field parameters are listed in PHC Update Table 1 and included in Attachment 1. Laboratory analysis results for the selected water monitoring sites in the expansion area are also included in Attachment 1. Graphs supporting the discussion regarding mining impacts to existing monitoring sites are included in Attachments 2, 3 and 4 of this document.

### **2.4 EXPLANATION OF CHEMICAL REPORTING UNITS AND TERMS**

No Changes Made

### **2.5 OVERVIEW OF MINE OPERATIONS**

#### **2.5.1 HISTORY OF MINE OWNERSHIP AND OPERATION**

In this PHC update, this section pertains to the operation of Dugout Canyon Mine. The Soldier Canyon Mine was idled in 1998 and has not been actively mined since that date. Future mine plans do include reopening the mine once the reserves at the Dugout Canyon Mine are depleted. Monitoring of the majority of the water monitoring sites associated with the Soldier Canyon Mine was suspended in 2003.

As an update to the history of the mine ownership, a brief discussion of the ownership of the Soldier Canyon and Dugout Mine properties is presented herein. Arco Coal

purchased the Soldier Canyon and Dugout Mine properties from Coastal Corporation in 1996 and combined this property with the Sufco and Skyline mines to form Canyon Fuel Company. Itochu purchased from Arco a portion of Canyon Fuel Company, LLC. Arco sold its interest in Canyon Fuel Company, LLC to Arch Coal, LLC in 1998. Itochu sold its interest in the Canyon Fuel properties in 2004 to Arch Coal. Currently, Arch Coal

Dugout Canyon Mine was opened in 1998 when mining activities began in the Rock Canyon seam. Longwall mining moved from the Rock Canyon seam to the Gilson seam in February 2004 and has continued through 2007. It is anticipated mining will continue to occur in either the Rock Canyon or Gilson seams at this mine through at least 2013.

## **2.5.2 MINING TECHNIQUES AND LOCATIONS**

Since the Dugout Mine was opened, the primary method of coal extraction has been using longwall techniques supported by development mining using continuous mining equipment. Initial mining within the Rock Canyon seam began with typical two- or three-entry systems for the headgates and tailgates. However, difficulties in roof control and depth of cover forced the mine to develop longwall panels that were and currently are separated by thick coal barrier pillars. Most of the future panels will be separated by barrier pillars. Improved roof control has been obtained by using the barrier pillar technique and subsidence over those panels separated by the barriers is notably less than those panels lacking the barrier pillars.

### **2.5.2.1 Rock Dusting**

No Changes Made

### **2.5.2.2 Water management and discharge to Dugout and Pace Creeks**

Water is collected in the Dugout Mine from numerous roof drips, fractures and faults. The water is managed through a series of sumps that include flooded gob and abandoned workings. Discharge rates and total volumes have changed throughout the years since the mine opened in 1998. Overall, between 1998 and September 2007, the average discharge rate from the mine to Dugout Creek has increased from a few gallons per minute to a rate of about 1200 gpm, though recent (July '07) discharge rates have occasionally been higher due to power failures and interception of additional ground water. Discharge to Pace Creek from the Pace Canyon Fan portals can also average as much as 700 gpm. Both discharge rates vary according to the volume of intercepted water, holding capacities within the sumps and gobs, and power availability.

Water discharged from the mine to both Dugout Creek and Pace Creek must be compliant with the limits of the mines UPDES permit. The mine has a limit of one ton per day of Total Dissolved Solids (TDS) as part of its UPDES permit. Dugout frequently cannot meet this limit and has entered into an agreement with the Utah Division of Water Quality to participate with in a salinity reduction program within the Price River drainage. The agreement allows the mine to discharge additional tons of TDS provided the mine continues to participate in the salinity reduction program. The program was initiated in 2005 and will continue through at least 2013. Tons of TDS discharged from the mine has averaged between approximately one and nine tons per day.

### **2.5.2.2 Methane Extraction**

Certain areas of the Dugout Mine contain methane gas. The gas is typically encountered at the mining face during both development and longwall mining. Methane gas is also released in the gob. To help reduce the volume of methane within the ventilation system of the mine, numerous methane drainage wells have been drilled and completed from the surface to above the coal seam in the developed longwall panels. The wells typically drain methane after the longwall has passed the well location. The methane drainage wells are operated until the methane concentration drops to a minimal level. The wells are then often shut in or abandoned.

Mining operations also have encountered hydrogen sulfide gases but not in the concentrations that methane gas has been encountered. Both the methane and hydrogen sulfide gasses appear to increase in volume as the depth of cover over the mined seam increases.

## **2.6 GEOLOGIC SETTING**

### **2.6.1 GEOLOGY**

The geologic setting of the Dugout Canyon Mine is discussed in some detail in Chapter 6 of the M&RP. The original PHC briefly describes the geologic setting of the Soldier Canyon. Other than the description of the physical location of that mine, the general description can be applied to some extent to the Dugout Canyon Mine.

### **2.6.2 BEDROCK FORMATIONS**

No Changes Made

### **2.6.3 GEOLOGIC STRUCTURE**

Bedrock in the Dugout Canyon Mine generally dips to the north-northeast at an average of 8 degrees. Normal faults do occur in the mine area but typically have throws measured in feet and not tens of feet. Most faults encountered underground have little no obvious surface expression. A few faults encountered underground have produced water from the floor and roof. Typically, the flow from the roof will diminish significantly over a short period of time while flow from the roof will also diminish but may persist for several months or even years.

Fractures are also encountered during the mining process and some can produce water similar to the faults. The majority of both the fault and fracture systems trend northwest to southeast. A few fractures and faults trend east west in the Pace Canyon area.

### **2.6.4 PHYSIOGRAPHY**

The description contained in the original PHC is adequate for the Dugout Canyon Mine. The same elements exist both at the Soldier Canyon and Dugout Canyon Mines.

## **2.7 HYDROLOGY**

### **2.7.1 CLIMATE**

This section of the PHC is adequate to describe the general climate of the Dugout Canyon Mine area. While a weather station has been installed at the Dugout Mine, it has not been in operation long enough to determine if there is any significant long term variances from the precipitation and average temperature data presented in the original PHC.

### **2.7.2 HYDROLOGY**

As described in the original PHC, Dugout Canyon Mine is located within the Price River Drainage. It currently operates within the Dugout Canyon, Pace Creek, Fish Creek, and Pine Creek drainages that are tributary to the Price River drainage. The 600 acre expansion will result in the mine operating within small portions of the Cow Canyon tributary to Nine Mile Canyon. Both the Price River and Nine Mile drainages are tributary to the Green River.

The general description of the function and water chemistry of the ephemeral, intermittent, and perennial streams in this section of the original PHC is adequate to describe the conditions within the existing permit area. While the 600 acre expansion will undermine a small portion of Cow Canyon, the mining and related minor amounts of subsidence will not occur under or near perennial streams. The segments of drainages that will be undermined in Cow Canyon are ephemeral in nature. Other than mine methane drainage wells, no significant surface disturbance that would impact the Cow Canyon drainage are planned. Ground water samples have been obtained from a few springs within the Cow Canyon drainage and are described in the Hydrogeology section of this update.

## **2.8 HYDROGEOLOGY**

No Changes Made

### **2.8.1 CHEMICAL EVOLUTION OF GROUND WATERS**

No Changes Made

### **2.8.2 DESCRIPTION OF GROUND WATER SYSTEMS**

This update to the PHC will concentrate on the physical characteristics of the spring locations and the flow volumes discharging from the springs associated with the Dugout Mine area. Since most of the monitored springs are currently located outside of the mining area, flow rates were chosen to be the parameter that would most likely be impacted by mining activities. The general water chemistry of the monitored springs has not significantly changed since monitoring began.

#### **2.8.2.1 Colton Ground Water System**

The Colton Formation forms the plateau within the 660 acre expansion area and contains the additional springs to be monitored as part of the expansion. The original

text discusses two springs that have been evaluated in the Soldier Canyon area, G96 and #45. Two springs have been included in the Dugout Canyon Mine water monitoring plan and are designated as Springs SC-65 and 260. Figures contained in Attachment 2 illustrate the history of the flow monitored at springs SC-65 and 260. Spring SC-65 has been monitored since October 1995 while Spring 260 has been monitored since June 2000. Both springs and their recharge areas are located north and outside the areas that have been undermined and subsided by Dugout Mine. Spring 260 will potentially be undermined since it is located over a longwall panel in the 600 acre expansion area. Both springs demonstrate seasonal flows. The variability of the flow from SC-65 appears to follow the pattern of drought and wet cycles as illustrated on the Palmer Hydrologic Drought Index figure included in Attachment 2. Flow from Spring 260 somewhat follows the cycle of drought and wet but not quite as clearly as SC-65.

Two new Colton springs have been added to the water monitoring plan for Dugout Mine. These two springs are 213 and 321. Spring 213 is located in the NW1/4 of Section 22 T13S R13E and Spring 321 is located in the NW1/4 of Section 17 T13S R13E. Both springs are located outside the area that is planned to be mined and subsided. Flows from these two springs were first gathered in May 2007 followed by measurements obtained in June, July, August, and October. Graphs of these flows are contained in Attachment 2. Measured flows appear to drop from a high following spring runoff to baseline conditions by August.

#### **2.8.2.2 Flagstaff Ground Water Systems**

The Flagstaff Formation is present in the Dugout Canyon area and in the 600 acre expansion. However, the formation thins to the east and eventually pinches out near the eastern portion of the mine permit area. Currently, the mine monitors two springs in the Flagstaff Formation, SC-100 and SP-20. Spring SP-20 was monitored briefly between June 1976 and October 1979. Monitoring of the spring was resumed in August 1997 and has continued through the present (October 2007). Spring SC-100 has been monitored since 1995 and continues to the present.

The graph of measured flow for SP-20 clearly demonstrates seasonal flows that are impacted significantly by drought and wet cycles. This spring is located outside the area that has been undermined by Dugout Mine. The recharge area for this spring is also likely to be outside the area affected by current Dugout mining operations.

Spring SC-100 is located upstream of the mine operations in the Dugout Creek drainage. It issues from the side of a stream bank near the bottom of the channel. According to water monitoring personnel, flows monitored between 1997 and 2002 may have included portions of the adjacent creek. Changes in the stream channel and spring discharge have allowed the flow of the spring to be monitored separately from the stream flow. The spring is located at least three fourths of a mile north of the current mine workings and is unlikely to have been impacted by mining operations.

No new monitoring sites are proposed for the Flagstaff Formation as part of the 600 acre expansion.

### 2.8.2.3 North Horn Ground Water Systems

Dugout Mine currently monitors five springs discharging from the North Horn ground water system. These springs are SC-14, SC-116, SC-200, SC-203, 259, and spring 259A. Graphs illustrating the flow of the springs are located in Attachment 2. SC-14 was monitored briefly between 1976 and 1979. Dugout mine started monitoring the flows again in 1995 and the monitoring has continued through at least October 2007. Flows from the spring appear to be influenced by seasonal and climatic variations in precipitation. This spring is located north and west of the current Dugout Mine workings and flow data obtained from this spring does not indicate impacts due to mining.

Spring SC-116 flow was first monitored at this site in October 1995 with regular monitoring initiated in November 1998. This spring is located in a tributary to Pace Creek and overlies a longwall panel Dugout Mine is likely to mine in 2008-2009. Historical flows indicate ground water discharge volume from the spring is related to cycles of drought and wet. Between June 2001 and November 2004, flow volumes were less than 2 gpm. Through the wetter cycle of 2005, flows increased. Then in the drier period of 2006, the flows once again diminished.

Spring SC-200 is located in a tributary to Rock Creek and is located southeast of current mine workings. This spring typically has no flow or flows less than 1 gpm. The recharge area for this spring is likely located south and east of the current mine plan and is unlikely to be impacted by planned future mining. Lack of flow at this site makes it difficult to determine how it is impacted by changes in climatic cycles. This site is important, however, since it appears to be the only accessible and reliable source of ground water discharge in this drainage.

Spring SC-203 is located in Pace Canyon and is east and outside of current and future mine workings. It is a developed spring that is used to water cattle. The flow graph of the spring illustrates flows typically between 2.5 and 5 gpm with occasional flows slightly less or greater. Flow was measured in the spring of 2003 at more than 20 gpm but that rate appears to be anomalous to other recorded flows. Spring flows do not appear to typically be impacted by climatic changes.

Spring 259 is associated with a slump in a side drainage of Pace Canyon. In 2002, the monitored discharge location moved as a result of renewed slumping. Monitoring of the original discharge point was continued even though groundwater no longer discharged from this location. The ground water currently discharges from a point a few hundred feet downstream of the original monitoring point. The slump was probably reactivated as a result of saturation from natural causes. Ground water continues to flow from the as reported through field observations noted by personnel monitoring the original site. A new monitoring point, 259A, was added to the monitoring program in July of 2007. This spring has been developed by the landowner for livestock watering and is located upstream of 259 and outside the slump area. Previous measurements of the discharge rates obtained in 2006 indicate the flow in early spring was about 1 gpm. The spring flows decrease by fall to approximately ¼ gpm. In the 2007, the spring flows gradually decreased through the summer and by September, the flow essentially ceased. This spring and its recharge area have not been subsided to date. However, the area may be subsided in 2008.



#### **2.8.2.4 Price River Ground Water System**

The text of the original PHC includes the Castlegate Sandstone within the Price River Formation. For purposes of this text, the Castlegate Sandstone will continue to be included as part of the Price River Formation.

During early baseline studies of the Dugout Mine area two springs were reported to discharge from the Price River Formation, springs SC-80 and 227. Spring SC-80 was initially intended to be included in the mine ground water monitoring plan. However, subsequent visits to the site resulted in no spring being found. Therefore, the site was not added to the plan. Spring 227 has been monitored since 2000 but no flow has yet to be observed discharging at this location. The lack of flow is not surprising based on the data and observations presented in the original PHC.

#### **2.8.2.5 Blackhawk Ground Water Systems**

##### 2.8.2.5.1 Springs

No Changes Made

##### 2.8.2.5.2 Blackhawk Formation Wells

The format of the original PHC included most of the ground water wells in the Soldier Canyon Mine and Dugout Mine area within this section. However, several of the wells are completed in formations other than the Blackhawk. Two ground water wells in the immediate area of the mine are included in the Dugout Mine water monitoring plan. These two wells, GW-10-2 and GW-11-2, are located north and down dip of the current Dugout Mine workings.

The water level in GW-10-2, which is completed in the Castlegate Sandstone, has been monitored since June of 1987 as reported in the original PHC. Depth to water was initially 716.0 feet. Water level data presented in the original PHC indicate the level in the well more or less was dropping between June 1987 and May 1995. The last reading obtained in 1985 indicated a water level 726.5 feet below top of casing. Dugout Mine began reporting water levels in March 1998 when the water level was measured at 732.0 feet below top of casing. Data collected by the mine indicates the water level has continued its general decline to a low of 745.0 feet below top of casing in May 2007 (See graph in Attachment 3).

As discussed in the original PHC, the cause for the decline in water level is unknown. The relatively steady rate of decline of the water level in the well does not appear to be relatable to the timing of underground mining and subsidence at the Dugout Canyon Mine. The rate of decline before mining appears to have continued after mining at Dugout commenced.

The water level in GW-11-2, a well completed in the Price River Formation, has been measured by Dugout Mine since August 1997. An earlier measurement, November 4, 1982, presented in the original PHC indicates the water level in the well to be 1127.39 feet below the top of casing. Dugout Mine's first reported water level on August 27, 1997 indicates the water level was 1120.90 feet below top of casing. By June 30, 1998 the water level had dropped to 1128.5 feet below top of casing. It remained within a few

feet of that level until June 15, 2006 when the water level was measured at 1116.17 feet below top of casing. The cause of the fluctuations in the water level of about 12 feet is unknown.

#### Soldier Canyon Mine

The Soldier Canyon Mine was idled in 1998. The portals were temporarily backfilled with soil and mine water discharge ceased. No water has discharged from the mine since the portals were sealed.

#### Dugout Canyon Mine

Water is collected in the Dugout Mine from numerous roof drips, fractures and faults. Currently, the highest volume of water entering the mine appears to discharge from intercepted fractures and faults with minor offset. The majority of the water discharging to the mine from the fractures and faults flows up through the floor. Overall rates of inflow of ground water to the mine also increase, independently of the fracture flow, as longwall panels are mined. Often longwall mining will intercept isolated aquifers above the roof of the mine that discharge water at a few tens to a few hundred gallons per minute after the coal has been removed. The flows associated with these isolated aquifers typically are short lived and either cease flowing altogether or significantly diminish in rate. Inflows from faults or fractures also diminish over time but at a much slower rate.

The ground water entering the mine is managed through a series of sumps that include flooded gob and abandoned workings. Discharge rates have changed throughout the years since the mine opened in 1998. From 1998, all of the water discharged from the mine was directed into Dugout Creek. Overall, between 1998 and September 2007, the average discharge rate from the mine to Dugout Creek has increased from a few gpm to over 1200 gpm. Beginning in July of 2007, a portion of the mine water has been discharged to Pace Creek through the Pace Canyon Portals. Discharge to Pace Creek from the Pace Canyon Fan portals can also average 700 gpm or more. Both discharge rates vary according to the volume of intercepted water, holding capacities within the sumps and gobs, and power availability.

It is important to note that before the construction of the Dugout Canyon Mine, two abandoned mine workings within the Gilson Seam were flooded to near the mouth of their old portals. In fact, the old Gilson workings on the east side of the canyon actually discharged water at the surface at a few gallons per minute to Dugout Creek. These workings were eventually drained by the mine for use as a sump. The flooded old Gilson seam workings on the west side of the canyon has also been used as a sump by the Dugout Canyon Mine.

#### **2.8.2.6 Star Point Sandstone Ground Water System**

As was observed and reported in the original PHC, no springs had been found discharging from the Star Point Sandstone in the Soldier Canyon and Dugout Canyon Mine areas. However, subsequent field studies found one spring, SC-64, that may be related to the Star Point Sandstone. This spring, however, is not part of the monitoring plan. Two samples were obtained from the site and field parameters were measured.

The samples indicate the water has a slightly alkaline pH (7.5) and relatively high specific conductance (1011 -1112 mmho)

#### **2.8.2.7 Mancos Shale Ground Water System**

No Mancos Shale ground water discharge has been observed in the Dugout Mine permit area. As noted in the original PHC, typical TDS concentrations of water associated with the Mancos Shale are about 10,000 mg/L. Water this brackish has not been found within the mine therefore suggesting water sources discharging to the mine are unlikely to include the Mancos Shale.

### **3.0 PROBABLE HYDROLOGIC CONSEQUENCES**

This section contains a description of the probable hydrologic consequences of operating the Dugout Canyon since 1997 and the additional 600 acres to be added to the mine area in 2008. The consequences are based on the observations and conclusions of the original PHC, observed reactions of surface and ground water to mining at Dugout Canyon Mine since 1997, and projected future potential impacts to these water systems due to mining.

#### **3.1 POTENTIAL ADVERSE IMPACTS TO THE HYDROLOGIC BALANCE (728.310)**

Coal mining has the potential to impact the hydrologic balance by:

1. decreasing creek flows and spring discharges by capturing surface or other ground waters,
2. increasing creek flows and spring discharges by increasing discharge rate of ground water from the Blackhawk ground water system, and
3. increasing ground water recharge rates to overlying ground water systems.

##### **3.1.1 Potential for Decreasing Creek Flows and Spring Discharges**

Coal mining has the potential to decrease creek flows and spring discharges by capturing water from these sources as a result of mine related subsidence, bedrock fracturing, and aquifer dewatering.

##### Decreasing Creek Flows

Generally, since subsidence began at the Dugout Canyon Mine, surface tension cracks have been noted in limited locations, typically on canyon rims that have been undermined. On the surface of the plateau overlying the mine and at the base of the drainages that bifurcate the plateau, cracks have been noted in the soils and alluvium covering bedrock. However, these cracks soon naturally heal and are no longer obvious. Surface runoff continuously entering subsidence cracks has not been observed in this area. Graphs illustrating the monitored flow volumes of the surface drainages in the Dugout Creek Mine area are included in Attachment 4.

Four surface water monitoring points have been established to record, on a quarterly basis, the flows in the Dugout, Pace, and Rock Canyon Creeks. DC-1 is located in the main stem of Dugout Creek below the mine site. DC-2 is located in the Left Fork just upstream of the mine site. DC-3 is located in the Right Fork just upstream of the mine site. Additionally, DC-4 and DC-5 have been established in the Left Fork of Dugout Creek and are monitored on a five year basis at permit renewal. Site PC-1A is located on Pace Creek upstream of currently planned mining activity and at the eastern permit boundary. PC-2 is located on Pace Creek downstream of planned mining activities and near the permit boundary. PC-3 is located in Pace Creek just downstream of the confluence of Pace Creek and an unnamed tributary in the south half of Section 20, Township 13 South, Range 13 East. This site was established in September 2007. RC-1 is located on Rock Creek downstream of any planned mining activities and near the southeastern boundary of the permit area (Plate 7.1 of the MRP).

The monitored flows within the Dugout Creek drainage system will be discussed first followed by Pace Creek and then Rock Canyon Creek flows. Dugout Canyon Mine has subsided minor portions of the Right Fork of Dugout Creek with single seam mining in the Gilson seam. As stated earlier, DC-3 was established to monitor flows in the Right Fork. A graph of the monitored flows at DC-3 between August 1997 and May 2007 is included in Attachment 4. The peaks that occur in 1998 and 2001 appear to be flows measured during spring runoff. A short segment of the Right Fork of Dugout Creek was subsided when coal was extracted from the Gil 2 panel in April 2005. Flows in the stream appear to be impacted from natural wet and drought cycles than by mining subsidence. No extra ordinary decreases in flow in the Right Fork were noted after mining and subsidence occurred.

The Left Fork of Dugout Creek has not been subsided. Flows measured at DC-2 appear to follow the drought-wet cycles noted in the Palmer Hydrologic Drought Index for this area.

The graph of Dugout Creek at site DC-1, which is located downstream of the mine, also does not show an abrupt change in flow volume at the time of subsidence in the Right Fork. However, it is important to note, the flow volume of Dugout Creek downstream of the mine is impacted by discharge from the mine to the creek at a point upstream of DC-1. Discharge from the mine began in March 2002.

Flows in Pace Creek have monitored on a quarterly basis at PC-1A and PC-2 since September 1999 and June 2000, respectively. Flow data was also collected at PC-2 from April 1978 to October 1979. Mining has not occurred upstream of PC-1A and no flow impacts from mining subsidence are anticipated. Flow measured at PC-2 also does not appear to have decreased as a result of mining and subsidence in the area. Mining and subsidence did not occur in the area upstream of this monitoring point until May 2005. Flows in Pace Creek at PC-2 currently appear to be controlled by the cycles of wet and drought. PC-3 was established at the time of the writing of this update and data will be collected at this site beginning in 1<sup>st</sup> quarter of 2007.

The flows in Rock Canyon Creek are monitored at site RC-1. The graph of the flows at site RC-1 illustrates the creek seldom contains water at this point. In fact, flows are typically seen in the creek bed at this site during significant snow melt runoff or after heavy precipitation events. No portions of the creek are currently planned to be subsided.

As described in the original PHC, the water intercepted underground during mining is likely moving north toward the Uinta Basin and eventually toward the Green River. The mine is currently removing only a small portion of the ground water contained in the overall regional system that would discharge to the Green River. Once mining is complete, it is likely the mine workings will flood to an elevation at or slightly below the mine portals, similar to the flooding of the old Gilson workings located in Dugout Canyon. Ground water in the Dugout Mine area will continue to migrate north and down dip toward the Uinta Basin.

#### Decreasing Spring Flows

As described in preceding sections of this PHC Update, flows in monitored springs do not appear to have been measurably decreased by mining activities. Two spring

monitoring sites have recorded changes in flows: spring SC-100 as erosion has moved the stream channel away from the ground water discharge point allowing more accurate flow measurements and spring SC-259 as a result of reactivated movement of the slump from which it discharges. Neither of these two springs have been subsided nor has their likely recharge areas. Spring 227 was undermined in April 2007 but flow records of this spring indicate it is typically dry.

Mining will include subsidizing springs in the Pace Canyon, Dugout Canyon, and Cow Canyon drainages (Plate 7.1 of the PHC). The majority of these springs are located in the same drainages as monitored springs. The potential exists that flow from these springs may be decreased for a short period of time or their discharge points moved. The springs within the Pace Canyon drainage generally discharge from the North Horn, Flagstaff or Colton Formation. The depth of cover between the spring discharge locations and their recharge area and the mine workings themselves exceed at least 1000 feet. While subsidence fracturing associated with mining at these depths does occur at the surface, it typically has not resulted in creating pathways from the surface to the mine workings. Typically, surface cracks only extend a few tens of feet into the bedrock before attenuating. Below that depth, the bedrock will typically react more plastically and bend, rather than break, as the ground over the mine longwall panels subside. The North Horn, Flagstaff, and Colton Formations contain significant beds of fine grained material, such as shale, siltstone, and claystone that will tend to heal if fractured. This healing process would likely stop or restrict rapid downward migration of water either from the surface or from aquifers.

Subsidence of a portion of the aquifers that feed these springs may cause recharge to temporarily "pool" in the subsided portion, thus temporarily decreasing discharge. Surface cracking of the aquifer may also result in the discharge point of the spring moving either laterally or vertically downward a few feet. While this phenomenon has not been noted in this area, it has been observed at other mine sites within the Book Cliffs area and the Wasatch Plateau. However, it is not anticipated there will be a loss of water to the Pace Canyon drainage system.

Springs within the Dugout Canyon drainage that may be undermined discharge from either the North Horn or Flagstaff Formations. As with the springs located in the Pace Canyon drainage, decreased flow or changes in discharge locations are possible. However as discussed in the preceding paragraphs, permanent decreases in flow volumes are unlikely and over all discharge of ground water volumes in the drainage are unlikely.

Several springs discharge from the Colton Formation north and east of the current permit area and the 600 acre expansion area within the Cow Canyon drainage. Only one known spring, 260, is planned to be undermined. Spring 260 is currently part of the Dugout Canyon Mine water monitoring program. The monitored flows are included in graphic form in Attachment 2 of this document. Discharges of this flow show a strong relationship to seasonal variations in precipitation. The springs in the Cow Canyon drainages appear to be stratigraphically controlled. That is, they appear to discharge at the down dip end of an exposed stratigraphic unit within the Colton Formation. Because the Colton Formation contains interbedded sandstones, siltstones, and shales, it is likely these springs discharge at the base of a sandstone overlying a less permeable unit such as shale or siltstone. This observation is generally supported by the topography of the spring areas. The springs appear to discharge in at a break in topography where there

is a break in the hillside from a relatively steep slope to a more gentle slope. There is also a potential for some of the springs to be both stratigraphically and structurally controlled. In other words, the springs discharge from a fracture within a permeable layer overlying a less permeable layer. Unfortunately, the thick soil mantle in the area precludes observation of structure near the discharge location.

Mining in the northeastern most portion of the permit area and within the 600 acre expansion area could decrease flows at or alter the discharge location for spring 260. It appears the recharge area for this spring is south of the spring location and overlies at least two planned panels. However, interruption of spring flow volume would likely be short-lived. Where Dugout Mine has designed longwall panels separated by thick barrier pillars, surface expressions of subsidence have been much less than where barrier pillars are not left in place. Projected surface subsidence at the spring 260 location is likely to be less than two feet. The spring itself is located near the center of the panel and at the near the bottom of the canyon. The recharge area is more than 2000 feet above the projected mine workings. Any interruption of flow would likely be temporary as the subsidence created low areas within the aquifer itself filled with recharge. Because of the fine-grained nature of the bedrock units, diversion of water from the aquifer into underlying bedrock units is unlikely. If 260 is also structurally controlled, new surface fractures related to subsidence may move the spring a few tens of feet either laterally or vertically. Overall, continued flow from 260 will continue to enter the Cow Canyon drainage.

Two new springs will be added to the Dugout water monitoring plan, 321 and 322 (Plate 7.1 of the MRP). Spring 321 is located north east of 260 in a small tributary to Cow Canyon. Spring 322 is located southeast of 260 and 321 in a tributary drainage of Cow Canyon. Tributary containing 322 runs roughly parallel to the tributary that contains 260 and 321. Some development work has been performed at spring 321. Both springs are outside of the area to be subsided. Since all of the springs, with the exception of 260, within the Cow Canyon drainage lie outside of the area to be mined and subsided, and the limited portions of the recharge area for the majority of the springs will be subsided, it seems unlikely a decrease in ground water discharge will occur. Also, it is unlikely discharge points will move for these springs as a result of mining.

### **3.1.2 Potential for Increasing Creek Flows and Spring Discharges**

#### **Increasing Creek Flows**

Dugout Canyon Mine discharges mine water to both Dugout Creek and Pace Creek at permitted UPDES discharge points. Increases in stream flows are likely to be limited to Dugout Creek and Pace Creek, the mine has no other discharge points planned at this time. In the original PHC, Mayo and Associates estimated the maximum ground water discharge rate from Dugout Canyon Mine would be approximately 800 gpm. That estimate was based on the assumption that Dugout Canyon Mine would produce about 1.0 million tons of coal per year. However, the mine has produced and currently is planned to produce between three and four million tons per year. That is three to four times the initial rate of production described in the original PHC.

In the summer of 2007, the Dugout Canyon Mine has discharged at a rate between 1900 and 2800 gpm through its UPDES discharge points. The rate at which the mine discharges water is based upon the volume of water intercepted, water contained in the

sumps and old workings, and the reliability of electrical power delivered to the mine. Early in the mining of the Rock Canyon and Gilson seams, ground water generally discharged from perched aquifers encountered in the Blackhawk Formation. As mining has progressed down dip, water discharging from fractures encountered in the mine floor, and to a lesser degree the mine roof, have become more prominent. It is estimated that more than half the total inflow to the mine is currently associated with flows moving through fractures or faults.

For the next several years as mining progresses north and down dip in the coal seams and deeper into the potentiometric surface of the underlying aquifers that discharge through the floor of the mine, inflow rates are likely to increase. However, as mining is then shifted to the southeast portion of the permit area (between Pace and Rock Canyons) and up dip in the coal seams, inflow rates from sources below the mine will likely be much less. Inflows to the mine at that time will be more likely dominated by inflows from isolated perched aquifers in the overlying Blackhawk Formation.

#### Increasing Spring Flows

Temporary increases of spring flows may be noted as the aquifers are compressed during subsidence. This is typically a transient phenomenon that ceases once the compressive and tensional forces within the subsided bedrock become static. In a few cases, spring flows may experience more long term increases if fracturing in the aquifer allows additional stored ground water to discharge at the spring location.

#### **3.1.3 Potential for Increasing the Ground Water Recharge to Overlying Ground Water Systems**

No Changes Made

### **3.2 IMPACTS OF PROPOSED COAL MINING AND RECLAMATION OPERATION (728.330)**

#### **3.2.1 Whether Acid-forming or Toxic Forming Materials Are Present that Could Result in the Contamination of Surface or Ground Water Supplies (728.331)**

The original PHC did not anticipate the construction, operation, reclamation of the Dugout Wasterock Site. However, subsequent revisions to the permit addressed the probable hydrologic consequences of creating the wasterock site. This issue is addressed in the document attached to the MRP titled "Refuse Pile Amendment, February 2003".

The remainder of this section has not been changed.

#### **3.2.2 Impact on Acidity, Total Suspended and Dissolved Solids and Other Important Water Quality Parameters of Local Impact (728.332)**

Mining in the Dugout Mine area should not affect the water quality of adjacent ground waters or springs since the ground water system in the mine layers is locally compartmentalized both vertically and horizontally.



Total Suspended Solids (TSS) above background concentration may increase in areas where road building or facilities construction may occur. Additionally, where subsidence occurs, down cutting may result and increase sediment load in the stream flow. It is also likely that subsidence will result in low areas where deposition of sediments will occur. TSS measured in the mine water discharge is typically at or near background levels.

Water discharged from the mine to Dugout Creek, and recently to Pace Creek, has contained total dissolved solid (TDS) concentrations ranging between 830 and 2440 mg/L. The concentration of TDS in the mine water is dependant upon the quality of the ground water encountered and residence time within the sumps and abandoned. It is apparent that the longer water is held underground in sumps and old workings, the higher the TDS values rise. Therefore, the mine has tried to balance the need for storage time to allow for the settlement of suspended solids while limiting the amount of time water stays in contact with the coal and overburden in the gob or abandoned flooded workings. Total iron concentrations in the water can either increase or decrease with the amount of oxygenation the mine water is subjected to or contact time the water has with exposed coal.

Initially in 2002 when mine water discharge began, Dugout mine discharged water with TDS concentrations between 1300 and 1500 mg/l at rates between 40 and 250 gpm with occasional higher spikes. Over time, the TDS concentration increased until the end of 2006. Since that time, discharge rates have nearly tripled but the TDS concentration has dropped to less than 1000 mg/l. The drop in TDS concentration is related in part to an increase in mine inflows and a reduction in residence time of the water.

The TDS level of the water discharged from the mine is currently about twice what the concentration in Dugout Creek was prior to mine water being discharged. However, it is important to note, prior to mine discharge, it was not uncommon for the creek to quit flowing within a few miles downstream of the mine location by mid to late summer. The water that was available was diverted a few miles downstream of the mine site east into the Pace Canyon drainage and used to grow alfalfa crops. The remaining water left the cultivated fields and flowed downstream across the Mancos Shale before eventually discharging to Grassy Trail Creek and then to the Price River. TDS concentrations in the stream, as it flowed downstream, continued to increase. Dugout Creek did not and currently does not contain a known fishery. Water in the stream is still used for cultivation of alfalfa. Wildlife and cattle also use the stream as a source of drinking water. The current TDS concentration of the water discharged from the mine is within the range established by the Utah Division of Water Quality for use by livestock.

Dugout Mine began discharging water to Pace Creek in the area of the mine's Pace Canyon Fan Portal. This water has been similar in quality to the mine water discharged at Dugout Creek. The water, when discharged from the mine, enters Pace Creek and eventually is diverted to water the same alfalfa fields as Dugout Creek waters. At this time, it is unknown if the mine will increase, decrease, or maintain the current discharge rates at the two locations.

To mitigate discharging into Dugout and Pace Creeks increased TDS volumes greater than one ton per day allowed by its UPDES permit, tributaries to the Colorado River System, the mine has participated in a salinity reduction program. To allow the mine to participate in the program, a cost per removal of a ton of TDS from the Price River Basin was determined by the appropriate State and Federal agencies. The mine determined

the total projected life of the mine, the average tons of TDS per month over that period, and multiplied the total tons by the cost per ton of removal. That amount was then paid in three equal annual installments to the Utah Division of Water Quality. The money was then made available to pay for projects that would remove tons of TDS from the Price River equivalent to the tons of TDS the mine discharged in excess of one ton per day. To the best of the mine's knowledge, this program overall has been successful in reducing the TDS concentration in the upper Colorado River Basin.

Total iron concentrations with the mine discharge waters have on occasion been measured at levels higher than background numbers obtained from Dugout and Pace Creek. However, under normal operating conditions total iron concentrations in the mine water is less than 1 mg/l, the UPDES limit for the mine water discharge.

### **3.2.3 Impact on Ground Water and Surface Water Availability (728.334)**

As described in Sections 3.1 and 3.2, it is anticipated that continued mining in the Dugout Canyon Mine and the 600 acre expansion will not affect the availability of ground water. However, mining will increase the baseflow of both Dugout Creek and Pace Creek. There should be no sustained increase of the surface water flows in Cow Canyon.

## **4.0 CONCLUSIONS**

No significant changes are proposed for this section since the basic conclusions reached in the original PHC, only an addition of text. Monitoring of springs and surface waters in the Dugout Canyon Mine area since 1998 has indicated there is no hydraulic connection between the mine and surface waters. Also, except for increasing the baseflow in Dugout and Pace Creeks, the effects of coal mining in the Dugout Canyon Mine within the Blackhawk Formation on overlying springs and surface water is and should continue to be negligible.

## **5.0 RECOMMENDATIONS**

### **5.1 SOLDIER CANYON MINE**

No Changes Made

### **5.2 DUGOUT CANYON MINE**

#### **5.2.1 Monitoring Wells**

No new monitoring wells are proposed for the Dugout Canyon Mine at this time. It is recommended the wells included in the monitoring plan continue to be measured.

#### **5.2.2 Streams**

No new stream monitoring points are proposed at this time for the Dugout Canyon Mine including the 600 acre expansion area.

#### **5.2.3 Springs**

Two new spring monitoring points are proposed for the Dugout area. The springs are located adjacent to the 600 acre expansion in the northeast portion of the permit area and within the Cow Canyon drainage. The springs are designated as sites 321 and 322. It is recommended these springs be monitored as per the ground water monitoring plan contained in Chapter 7 of the MRP.

**6.0 REFERENCES CITED**

No Changes Made

**ATTACHMENT 1**

PHC Update Figure 1  
Table 1 600 Acre Baseline Spring Field Data  
Baseline Water Quality Data for Springs 321 and 322







"321" Monitoring Data 2007

Date	Time	pH	Cond.	Temp.	Flow (gpm)	Comments
3/15/07	1220				NOA	Snow/Ice
5/18/07	1420	8.08	406	4	1.5	
6/21/07	1114	8.11	410	7.6	1.3	
7/24/07	834	7.38	469	8.5	0.75	
8/30/07	1205	7.42	471	8	0.7	

"322" Monitoring Data 2007

Date	Time	pH	Cond.	Temp.	Flow (gpm)	Comments
3/15/07	1220				NOA	Snow/Ice
6/21/07	905	7.84	704	7	18	
7/24/07	916	7.91	698	9	0.2	Livestock
8/30/07	1130	7.91	663	11	0.1	Livestock

SPRING 211				
Date	Conductivity mmhos	pH	Temperature C	Flow gpm
5/11/2007	693	8.01	3.00	1.50
6/15/2007	653	7.80	7.60	0.62

SPRING 211A				
Date	Conductivity mmhos	pH	Temperature C	Flow gpm
5/11/2007	527	7.63	2.0	2.50
6/15/2007	538	7.73	9.3	0.48

SPRING 213				
Date	Conductivity mmhos	pH	Temperature C	Flow gpm
5/11/2007	499	7.55	10.0	seep

SPRING 214				
Date	Conductivity mmhos	pH	Temperature C	Flow gpm
5/11/2007	561	7.34	5.0	0.50
6/15/2007				0.00

SPRING 260A				
Date	Conductivity mmhos	pH	Temperature C	Flow gpm
5/18/2007	369	7.64	5.0	6.00
6/21/2007	12/23/1900	8.09	8.6	2.50



SPRING 262				
Date	Conductivity mmhos	pH	Temperature C	Flow gpm
5/18/2007	411	7.98	5.0	7.00
6/21/2007	359	8.04	8.1	7.00

SPRING 262A				
Date	Conductivity mmhos	pH	Temperature C	Flow gpm
6/21/2007	401	7.82	7.8	10.50

SPRING 263				
Date	Conductivity mmhos	pH	Temperature C	Flow gpm
5/18/2007	390	7.17	4.0	1.50
6/21/2007	408	7.69	11.7	0.75

SPRING 263 A				
Date	Conductivity mmhos	pH	Temperature C	Flow gpm
6/21/2007	403	7.91	8.1	0.60

SPRING 300				
Date	Conductivity mmhos	pH	Temperature C	Flow gpm
5/11/2007	496	7.92	10.0	0.25
6/15/2007	449	8.23	11.2	0.22

SPRING 301				
Date	Conductivity mmhos	pH	Temperature C	Flow gpm
5/11/2007	469	7.48	5.0	0.50

SPRING 320				
Date	Conductivity mmhos	pH	Temperature C	Flow gpm
5/18/2007	458	8.21	15.0	45.00

# ACZ Laboratories, Inc.

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

## Inorganic Analytical Results

### Soldier Creek Coal Company

Project ID:

Sample ID: 321

ACZ Sample ID: L63413-01

Date Sampled: 06/21/07 00:00

Date Received: 06/25/07

Sample Matrix: Ground Water

#### Inorganic Prep

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Total Hot Plate Digestion	M200.2 ICP							06/27/07 19:18	erf

#### Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Calcium, dissolved	M200.7 ICP	77.5			mg/L	0.2	1	07/03/07 13:37	msh
Iron, dissolved	M200.7 ICP		U		mg/L	0.02	0.05	07/03/07 13:37	msh
Iron, total	M200.7 ICP	1.59		*	mg/L	0.02	0.05	07/05/07 22:24	djt
Magnesium, dissolved	M200.7 ICP	22.5			mg/L	0.2	1	07/03/07 13:37	msh
Manganese, dissolved	M200.7 ICP		U		mg/L	0.005	0.03	07/03/07 13:37	msh
Manganese, total	M200.7 ICP	0.024	B		mg/L	0.005	0.03	07/05/07 22:24	djt
Potassium, dissolved	M200.7 ICP	1.0	B		mg/L	0.3	2	07/03/07 13:37	msh
Sodium, dissolved	M200.7 ICP	9.2			mg/L	0.3	2	07/03/07 13:37	msh

#### Wet Chemistry

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO <sub>3</sub>	SM2320B - Titration								
Bicarbonate as CaCO <sub>3</sub>		270			mg/L	2	20	06/26/07 0:00	lcp/jlf
Carbonate as CaCO <sub>3</sub>			U		mg/L	2	20	06/26/07 0:00	lcp/jlf
Hydroxide as CaCO <sub>3</sub>			U		mg/L	2	20	06/26/07 0:00	lcp/jlf
Total Alkalinity		270			mg/L	2	20	06/26/07 0:00	lcp/jlf
Cation-Anion Balance	Calculation								
Cation-Anion Balance		6.1			%			07/10/07 15:15	calc
Sum of Anions		5.4			meq/L	0.1	0.5	07/10/07 15:15	calc
Sum of Cations		6.1			meq/L	0.1	0.5	07/10/07 15:15	calc
Chloride	325.2 / SM4500Cl-E	3	B	*	mg/L	1	5	07/02/07 15:00	aml/jag
Residue, Filterable (TDS) @180C	160.1 / SM2540C	290			mg/L	10	20	06/28/07 15:50	jlf
Sulfate	SM4500 SO4-D		U	*	mg/L	10	50	07/03/07 9:20	aeH
TDS (calculated)	Calculation	275			mg/L	10	50	07/10/07 15:15	calc
TDS (ratio - measured/calculated)	Calculation	1.05						07/10/07 15:15	calc

**Soldier Creek Coal Company**

Project ID:

Sample ID: 321

ACZ Sample ID: **L64797-01**

Date Sampled: 08/30/07 12:05

Date Received: 09/04/07

Sample Matrix: Ground Water

## Inorganic Prep

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Total Hot Plate Digestion	M200.2 ICP							09/05/07 14:15	bjl

## Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Calcium, dissolved	M200.7 ICP	75.9			mg/L	0.2	1	09/06/07 3:00	djt
Iron, dissolved	M200.7 ICP	0.03	B		mg/L	0.02	0.05	09/06/07 3:00	djt
Iron, total	M200.7 ICP	0.24			mg/L	0.02	0.05	09/06/07 20:31	erf
Magnesium, dissolved	M200.7 ICP	22.1			mg/L	0.2	1	09/06/07 3:00	djt
Manganese, dissolved	M200.7 ICP	0.014	B		mg/L	0.005	0.03	09/06/07 3:00	djt
Manganese, total	M200.7 ICP	0.007	B		mg/L	0.005	0.03	09/06/07 20:31	erf
Potassium, dissolved	M200.7 ICP	1.1	B		mg/L	0.3	2	09/06/07 3:00	djt
Sodium, dissolved	M200.7 ICP	10.0			mg/L	0.3	2	09/06/07 3:00	djt

## Wet Chemistry

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO <sub>3</sub>	SM2320B - Titration								
Bicarbonate as CaCO <sub>3</sub>		274			mg/L	2	20	09/06/07 0:00	lcp
Carbonate as CaCO <sub>3</sub>			U		mg/L	2	20	09/06/07 0:00	lcp
Hydroxide as CaCO <sub>3</sub>			U		mg/L	2	20	09/06/07 0:00	lcp
Total Alkalinity		274			mg/L	2	20	09/06/07 0:00	lcp
Cation-Anion Balance	Calculation								
Cation-Anion Balance		4.3			%			09/17/07 0:00	calc
Sum of Anions		5.5			meq/L	0.1	0.5	09/17/07 0:00	calc
Sum of Cations		6.0			meq/L	0.1	0.5	09/17/07 0:00	calc
Chloride	325.2 / SM4500Cl-E	2	B	*	mg/L	1	5	09/10/07 12:59	mls
Residue, Filterable (TDS) @180C	160.1 / SM2540C	290			mg/L	10	20	09/04/07 16:22	lcp
Sulfate	SM4500 SO <sub>4</sub> -D		U		mg/L	10	50	09/05/07 9:14	aeh
TDS (calculated)	Calculation	276			mg/L	10	50	09/17/07 0:00	calc
TDS (ratio - measured/calculated)	Calculation	1.05						09/17/07 0:00	calc

**Soldier Creek Coal Company**

Project ID:

Sample ID: 322

ACZ Sample ID: **L64797-02**

Date Sampled: 08/30/07 11:30

Date Received: 09/04/07

Sample Matrix: Ground Water

**Inorganic Prep**

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Total Hot Plate Digestion	M200.2 ICP							09/05/07 15:10	bjl

**Metals Analysis**

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Calcium, dissolved	M200.7 ICP	91.6			mg/L	0.2	1	09/06/07 3:04	djt
Iron, dissolved	M200.7 ICP		U		mg/L	0.02	0.05	09/06/07 3:04	djt
Iron, total	M200.7 ICP	8.27			mg/L	0.02	0.05	09/06/07 20:35	erf
Magnesium, dissolved	M200.7 ICP	41.3			mg/L	0.2	1	09/06/07 3:04	djt
Manganese, dissolved	M200.7 ICP	0.014	B		mg/L	0.005	0.03	09/06/07 3:04	djt
Manganese, total	M200.7 ICP	0.512			mg/L	0.005	0.03	09/06/07 20:35	erf
Potassium, dissolved	M200.7 ICP	1.5	B		mg/L	0.3	2	09/06/07 3:04	djt
Sodium, dissolved	M200.7 ICP	25.7			mg/L	0.3	2	09/06/07 3:04	djt

**Wet Chemistry**

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO <sub>3</sub>	SM2320B - Titration								
Bicarbonate as CaCO <sub>3</sub>		390			mg/L	2	20	09/06/07 0:00	lcp
Carbonate as CaCO <sub>3</sub>		6	B		mg/L	2	20	09/06/07 0:00	lcp
Hydroxide as CaCO <sub>3</sub>			U		mg/L	2	20	09/06/07 0:00	lcp
Total Alkalinity		396			mg/L	2	20	09/06/07 0:00	lcp
Cation-Anion Balance	Calculation								
Cation-Anion Balance		2.8			%			09/17/07 0:00	calc
Sum of Anions		8.6			meq/L	0.1	0.5	09/17/07 0:00	calc
Sum of Cations		9.1			meq/L	0.1	0.5	09/17/07 0:00	calc
Chloride	325.2 / SM4500Cl-E	2	B	*	mg/L	1	5	09/10/07 13:01	mls
Residue, Filterable (TDS) @180C	160.1 / SM2540C	430			mg/L	10	20	09/04/07 16:23	lcp
Sulfate	SM4500 SO <sub>4</sub> -D	30	B		mg/L	10	50	09/05/07 9:19	aeh
TDS (calculated)	Calculation	432			mg/L	10	50	09/17/07 0:00	calc
TDS (ratio - measured/calculated)	Calculation	1.00						09/17/07 0:00	calc



**Soldier Creek Coal Company**

Project ID:

Sample ID: 322

ACZ Sample ID: **L63413-02**

Date Sampled: 06/21/07 00:00

Date Received: 06/25/07

Sample Matrix: Ground Water

## Inorganic Prep

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Total Hot Plate Digestion	M200.2 ICP							06/27/07 19:30	erf

## Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Calcium, dissolved	M200.7 ICP	91.4			mg/L	0.2	1	07/03/07 13:40	msh
Iron, dissolved	M200.7 ICP		U		mg/L	0.02	0.05	07/03/07 13:40	msh
Iron, total	M200.7 ICP	0.69		*	mg/L	0.02	0.05	07/05/07 22:28	djt
Magnesium, dissolved	M200.7 ICP	43.8			mg/L	0.2	1	07/03/07 13:40	msh
Manganese, dissolved	M200.7 ICP	0.018	B		mg/L	0.005	0.03	07/03/07 13:40	msh
Manganese, total	M200.7 ICP	0.040			mg/L	0.005	0.03	07/05/07 22:28	djt
Potassium, dissolved	M200.7 ICP	1.5	B		mg/L	0.3	2	07/03/07 13:40	msh
Sodium, dissolved	M200.7 ICP	24.5			mg/L	0.3	2	07/03/07 13:40	msh

## Wet Chemistry

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO <sub>3</sub>	SM2320B - Titration								
Bicarbonate as CaCO <sub>3</sub>		380			mg/L	2	20	06/26/07 0:00	lcp/jif
Carbonate as CaCO <sub>3</sub>			U		mg/L	2	20	06/26/07 0:00	lcp/jif
Hydroxide as CaCO <sub>3</sub>			U		mg/L	2	20	06/26/07 0:00	lcp/jif
Total Alkalinity		380			mg/L	2	20	06/26/07 0:00	lcp/jif
Cation-Anion Balance	Calculation								
Cation-Anion Balance		5.1			%			07/10/07 15:15	calc
Sum of Anions		8.3			meq/L	0.1	0.5	07/10/07 15:15	calc
Sum of Cations		9.2			meq/L	0.1	0.5	07/10/07 15:15	calc
Chloride	325.2 / SM4500Cl-E	3	B	*	mg/L	1	5	07/02/07 15:02	aml/jag
Residue, Filterable (TDS) @180C	160.1 / SM2540C	420			mg/L	10	20	06/28/07 15:52	jif
Sulfate	SM4500 SO <sub>4</sub> -D	30	B	*	mg/L	10	50	07/03/07 9:23	aeh
TDS (calculated)	Calculation	422			mg/L	10	50	07/10/07 15:15	calc
TDS (ratio - measured/calculated)	Calculation	1.00						07/10/07 15:15	calc

# SOLDIER / DUGOUT CANYON MINES

Sample Identification	Sample Date	Laboratory Protocol	321	322	0F001
			2	2	7/24/2007
Time			834	916	1104
Laboratory Analyses					
Total Dissolved Solids mg/l			X	X	X
Total Suspended Solids mg/l			-	-	X
Oil and Grease mg/l			-	-	-
Bicarbonate mg/l			X	X	-
Carbonate mg/l			X	X	-
Calcium (Dissolved) mg/l			X	X	-
Chloride mg/l			X	X	-
Iron (Dissolved) mg/l			X	X	X
Iron (Total) mg/l			X	X	X
Magnesium (Dissolved) mg/l			X	X	-
Manganese (Dissolved) mg/l			X	X	-
Manganese (Total) mg/l			X	X	-
Potassium (Dissolved) mg/l			X	X	-
Sodium (Dissolved) mg/l			X	X	-
Sulfate mg/l			X	X	-
Cations meq/l			X	X	-
Anions meq/l			X	X	-
Total Hardness (CaCO3) mg/l			-	-	-

RELINQUISHED BY:		RECEIVED BY:		DATE	TIME	DATE	TIME

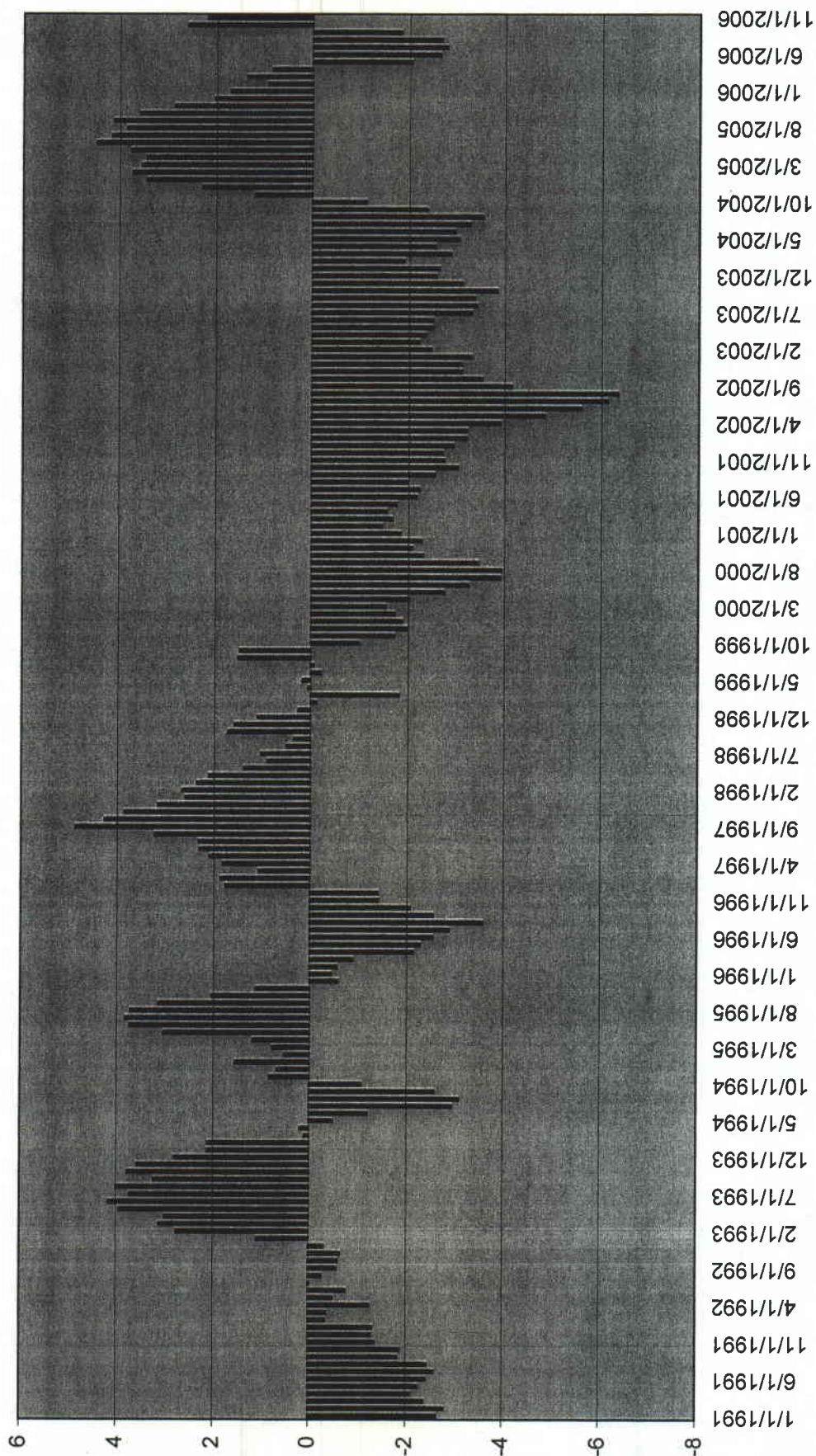
Protocol Identification	
1 - Dugout Canyon Mine (Surface Water)	Bottles - U, W, G, R, O
2 - Dugout Canyon Mine (Ground Water)	Bottles - U, W, G, R
3 - Soldier Canyon Mine (Surface Water) - 1st, 2nd & 4th Quarters	Bottles - U, W, G, O
4 - Soldier Canyon Mine (Surface Water) - 3rd Quarter Only	Bottles - U, W, G, R & O
5 - Soldier Canyon Mine (Ground Water) - 1st, 2nd & 4th Quarters	Bottles - U, W, G
6 - Soldier Canyon Mine (Ground Water) - 3rd Quarter Only	Bottles - U, W, G, R
7 - Banning Loadout (Ground Water)	Bottles - U, W, G, R

**ATTACHMENT 2**

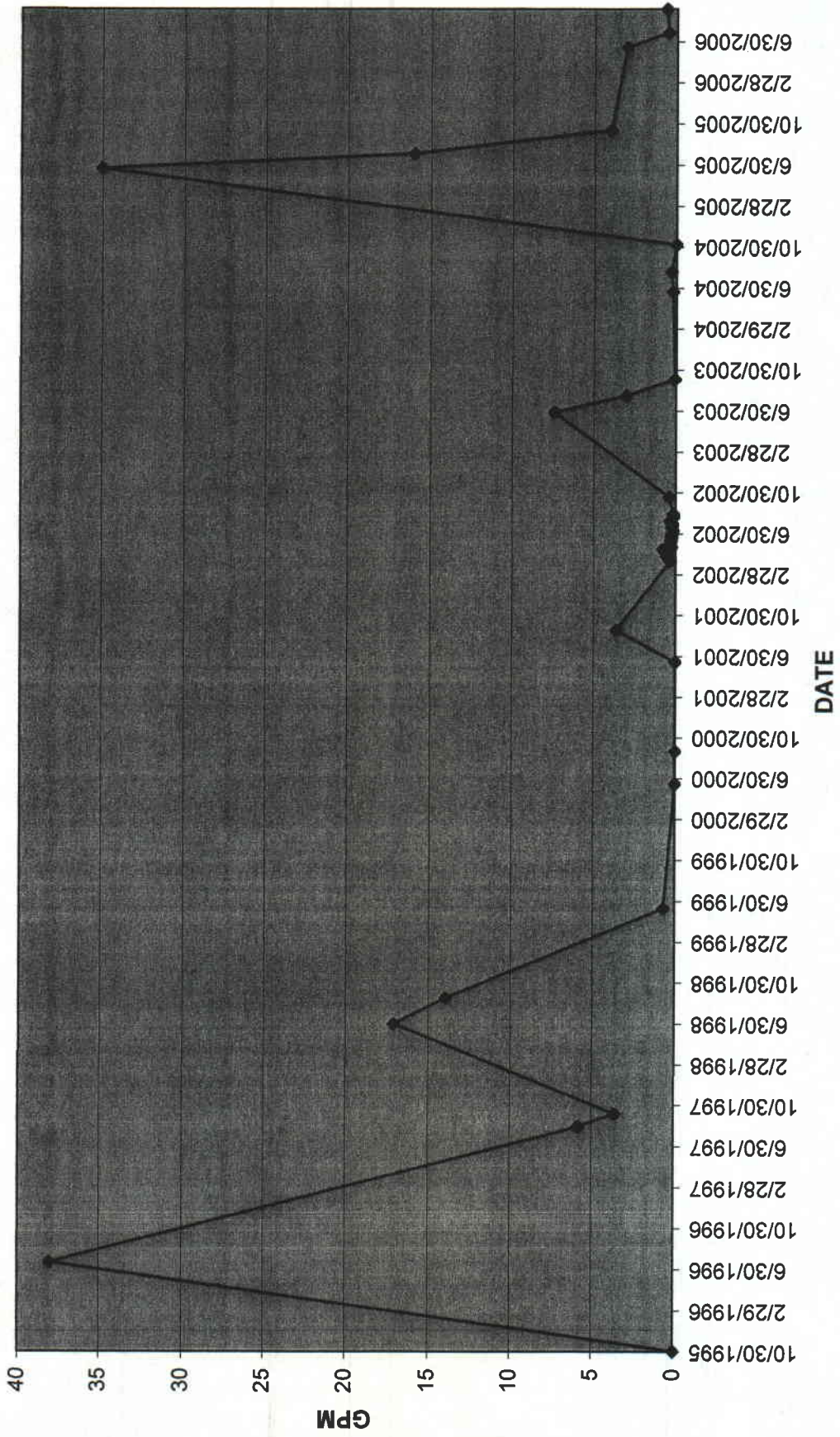
**Palmer Hydrologic Drought Index, Region 6 and 7, 1991-2006  
Spring Flow Graphs for Dugout Canyon Mine Sites**



**PALMER HYDROLOGIC DROUGHT INDEX  
REGION 6 AND 7  
1991 - 2006**

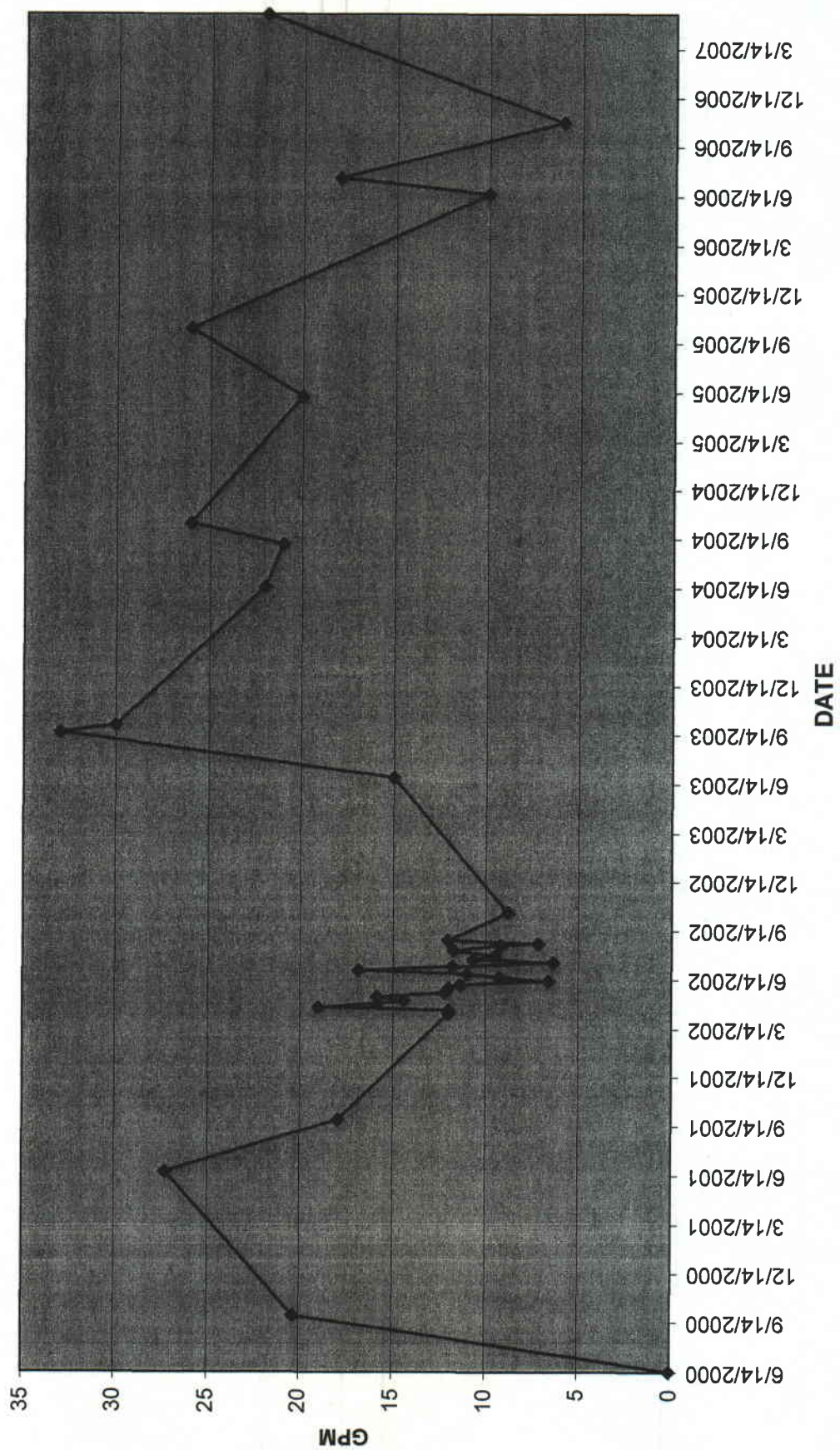


Spring SC-65  
Flow

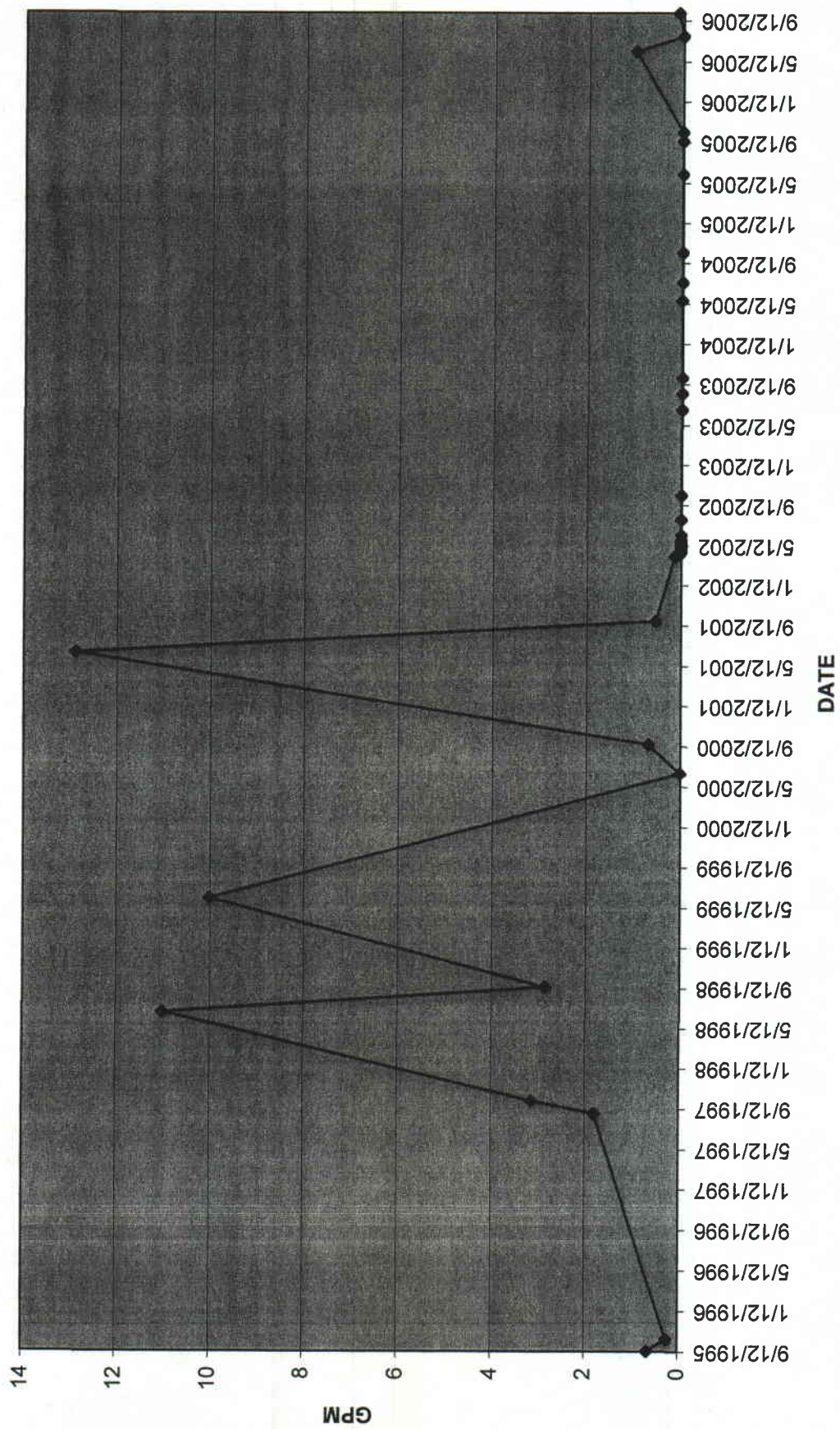




# Spring 260 Flow

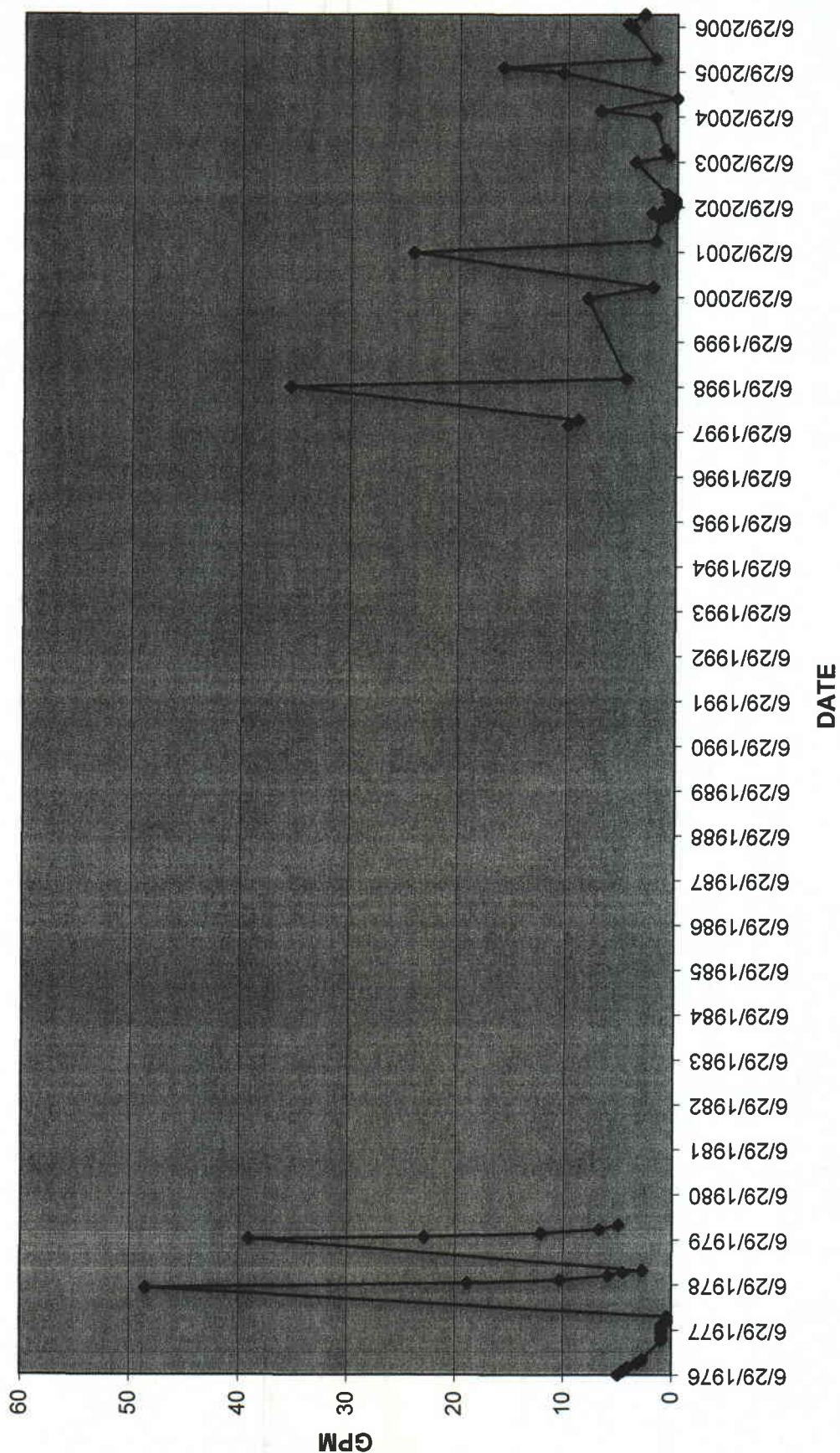


Spring SC-100  
Flow

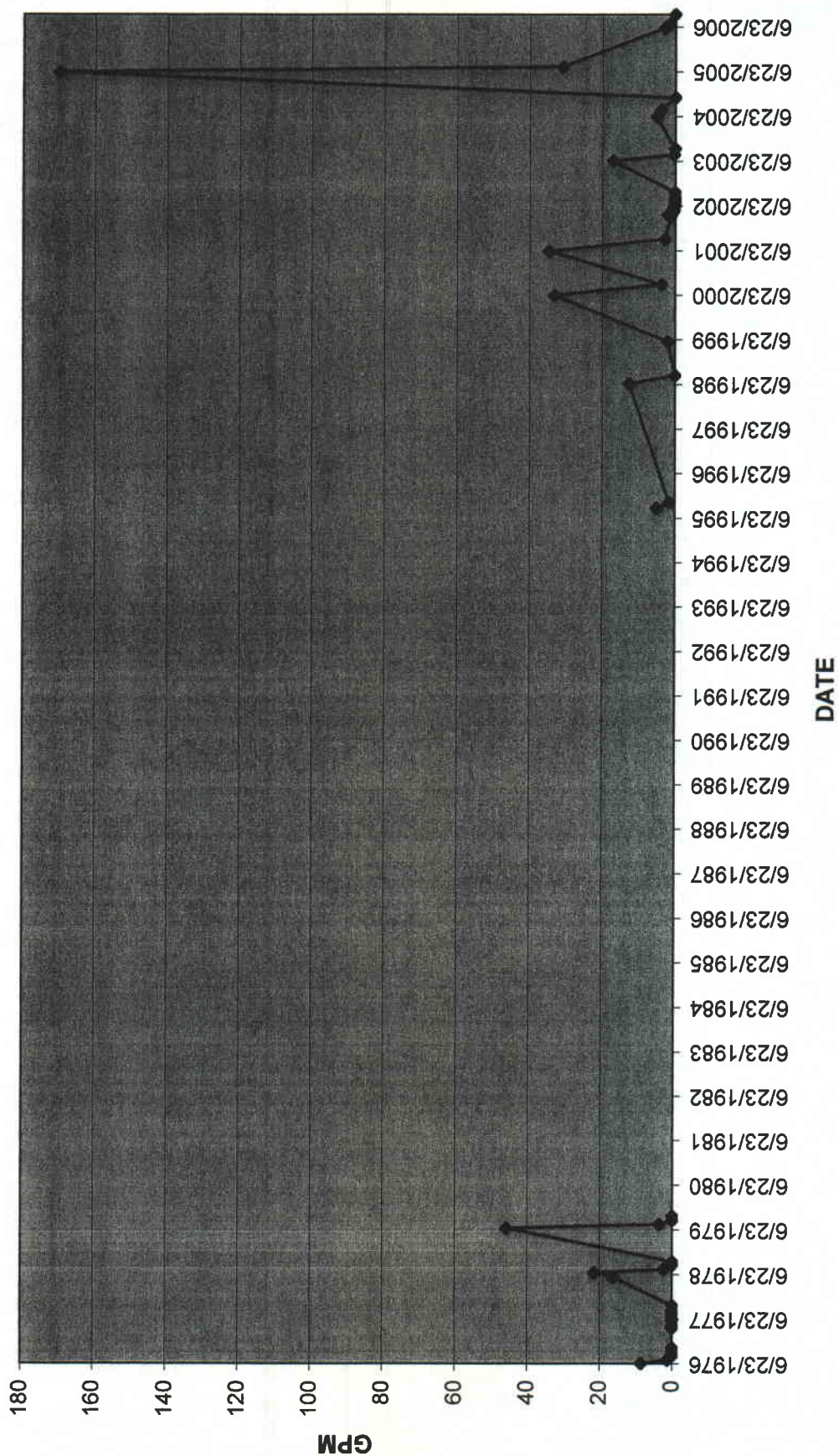




# Spring SP-20 Flow

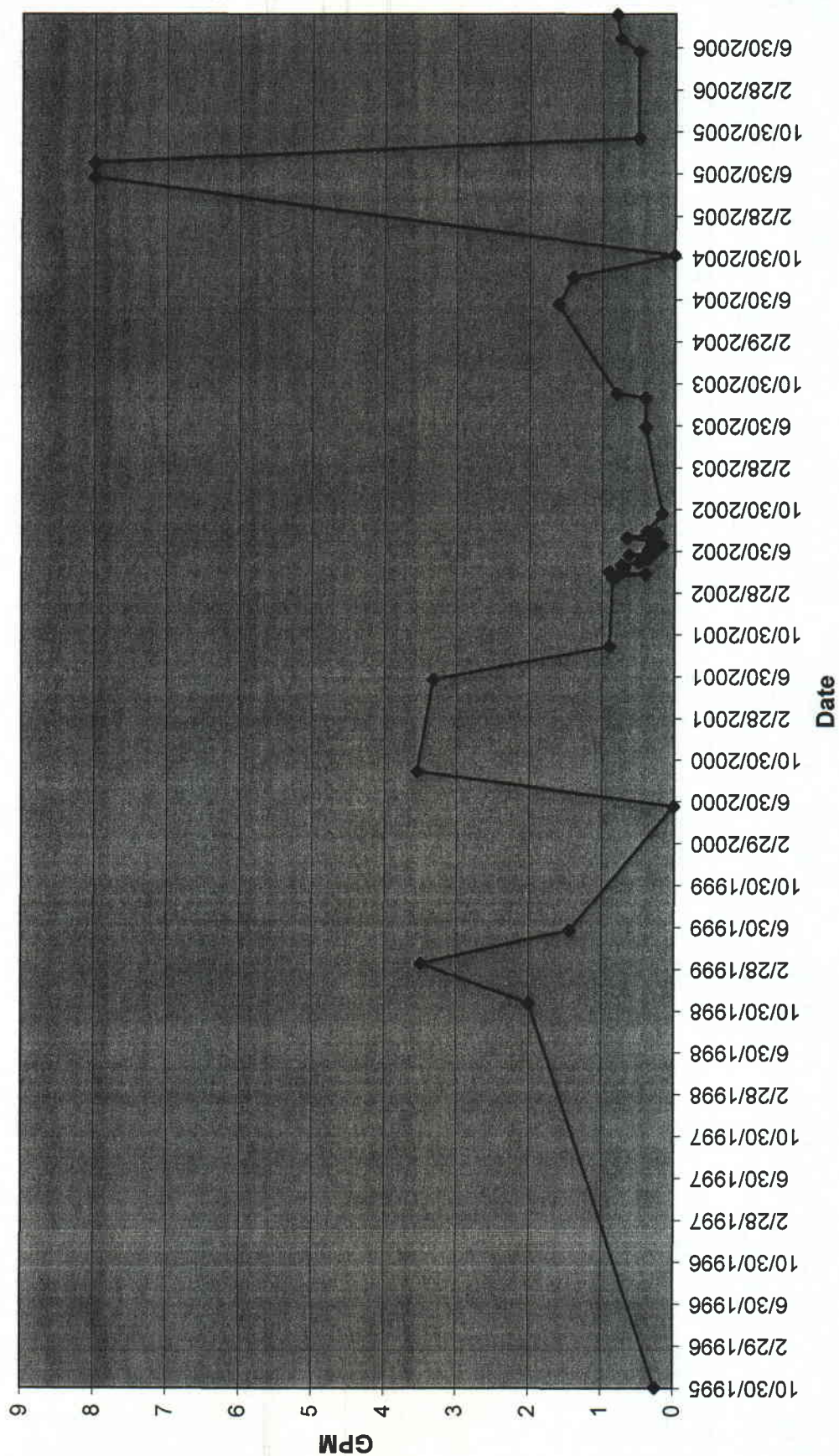


# Spring SC-14 Flow

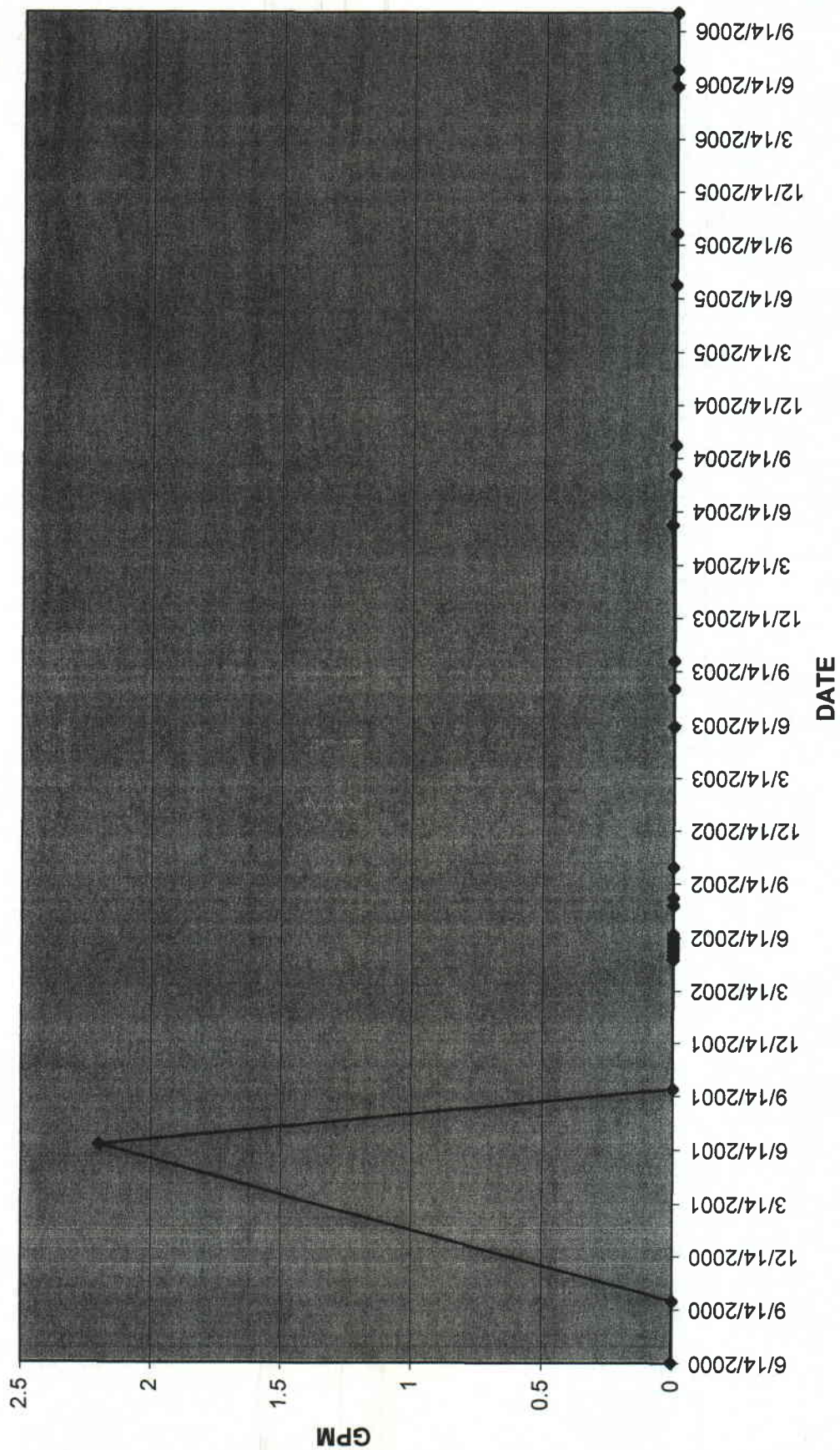




# Spring SC-116 Flow

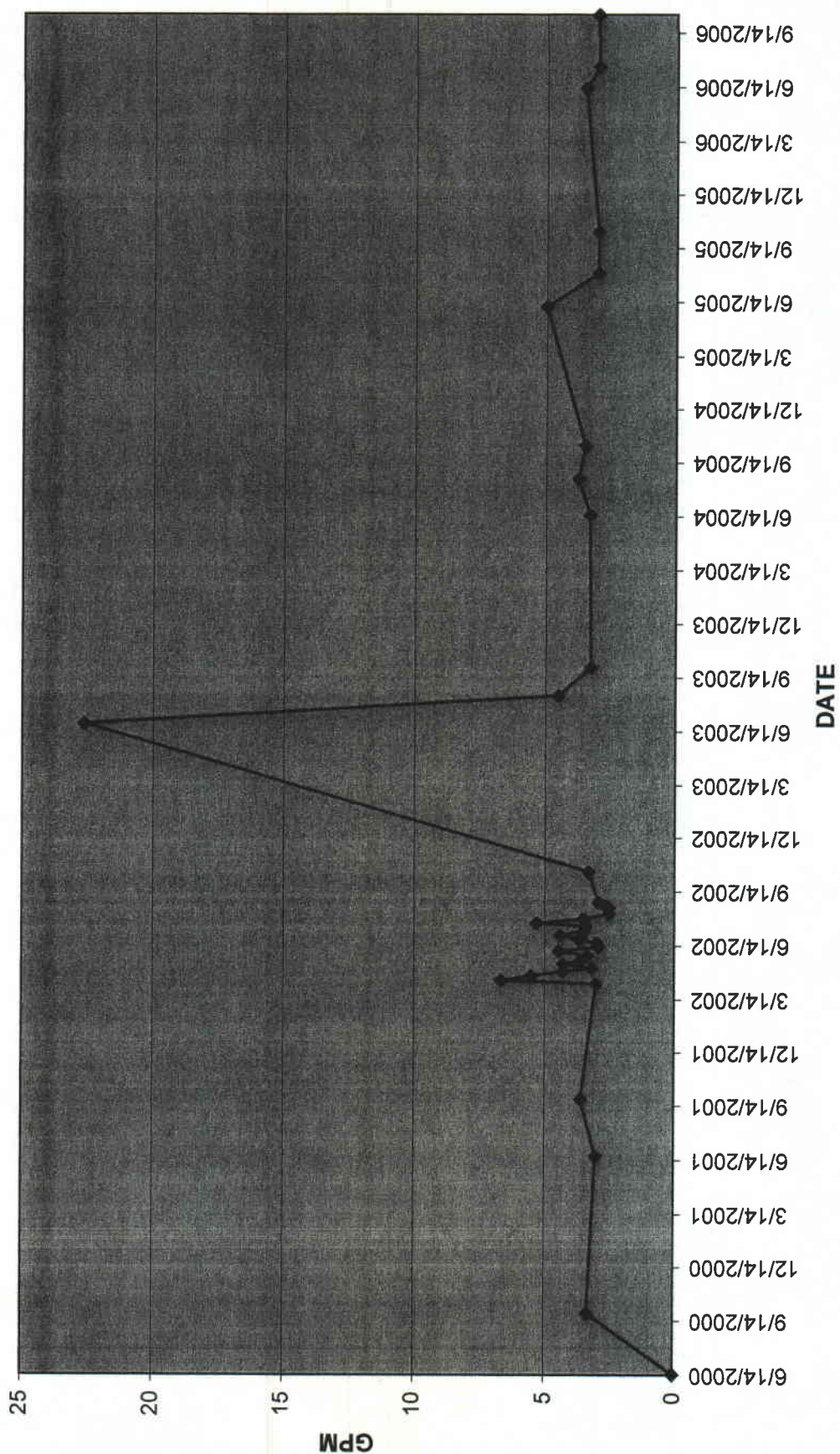


# Spring SC-200 Flow

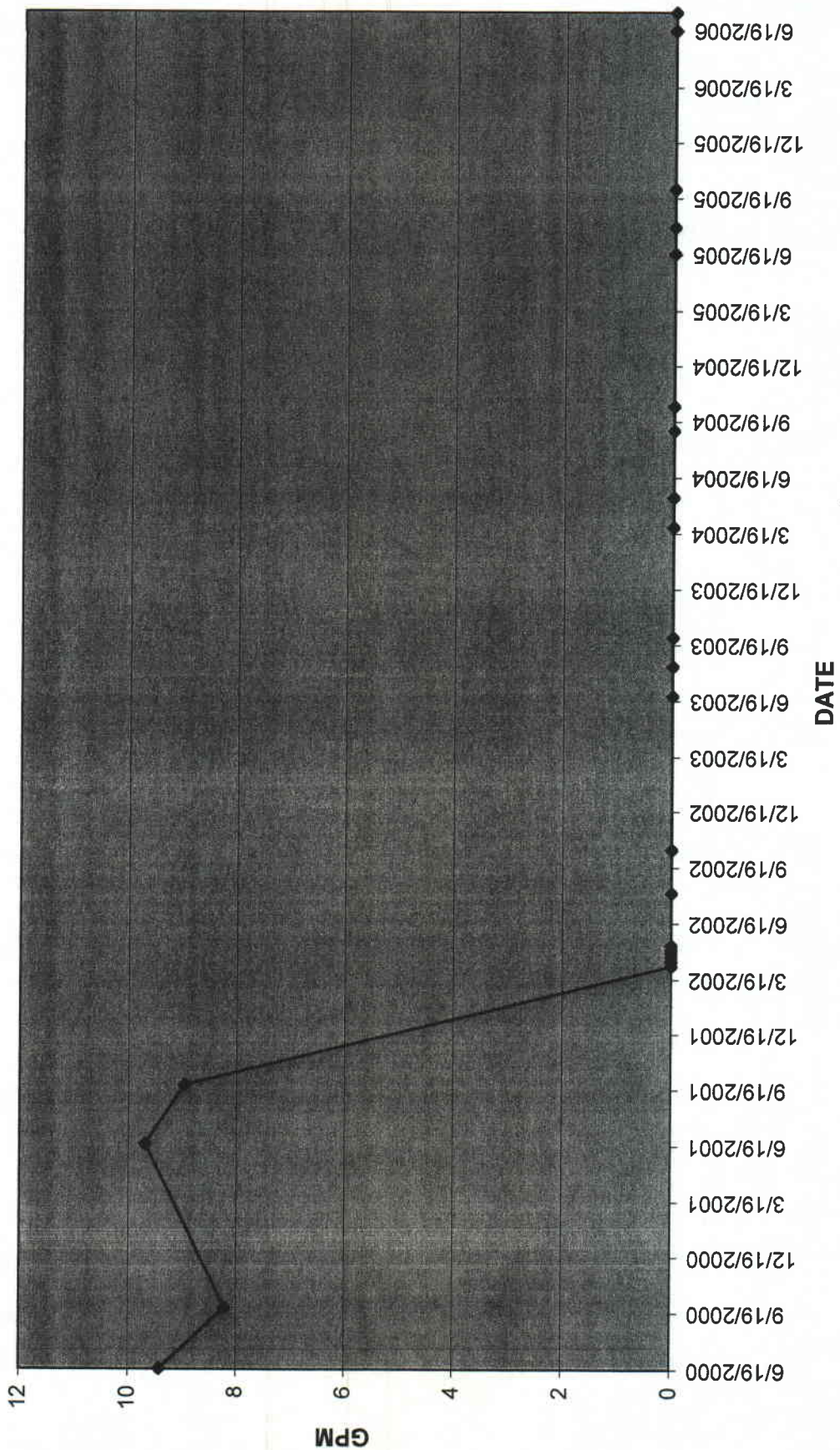




# Spring 203 Flow

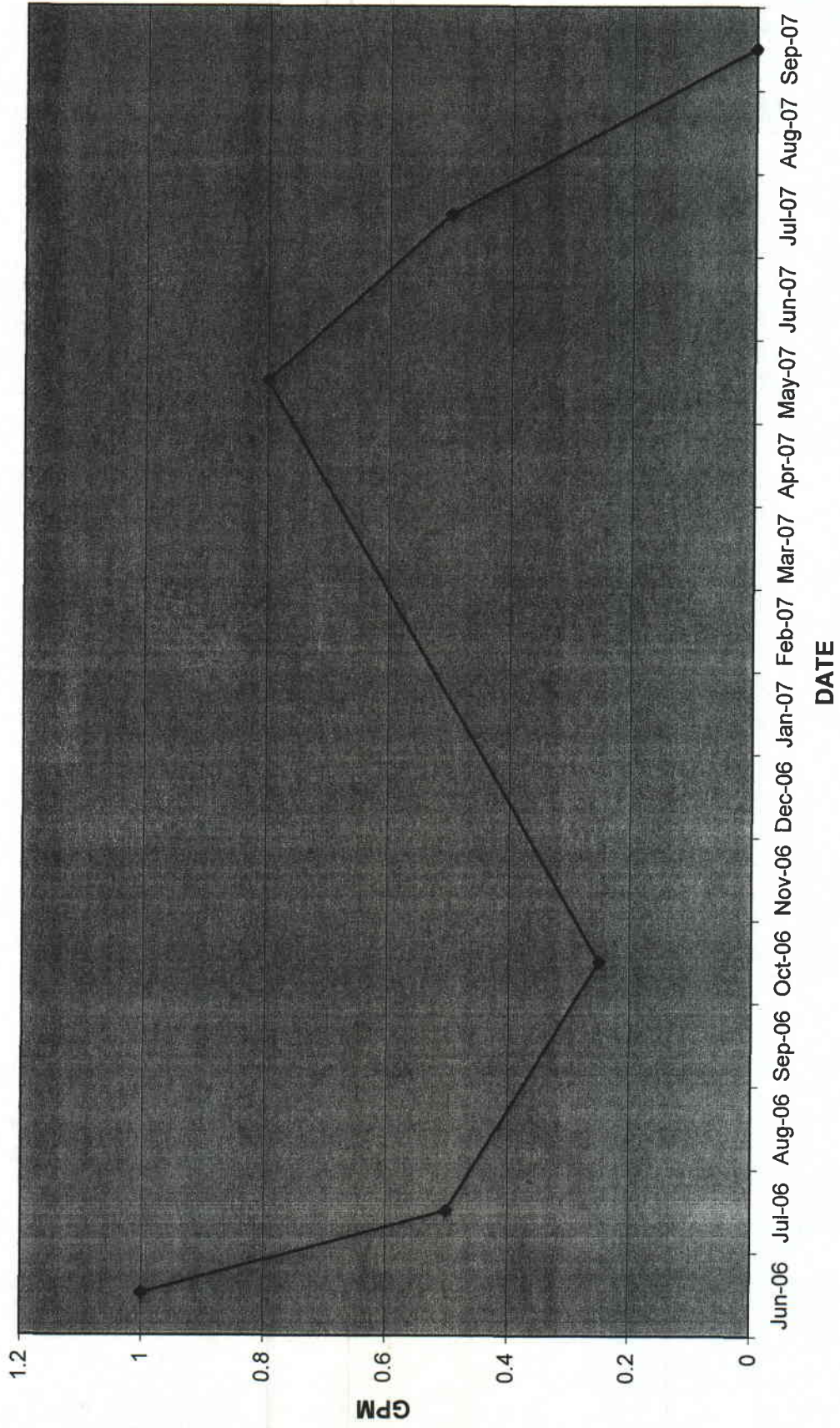


# Spring 259 Flow





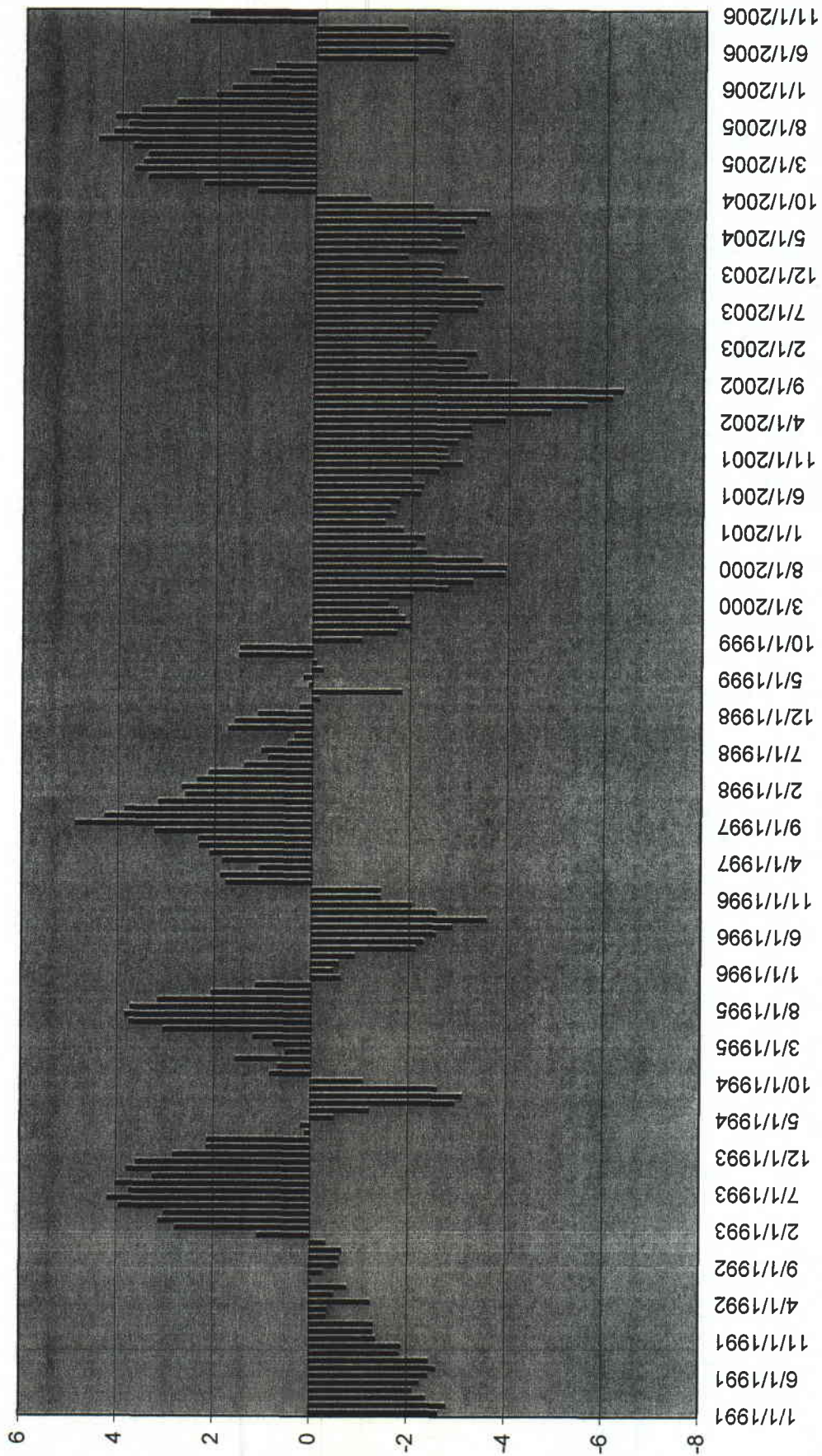
# Spring 259A Flow



**ATTACHMENT 3**

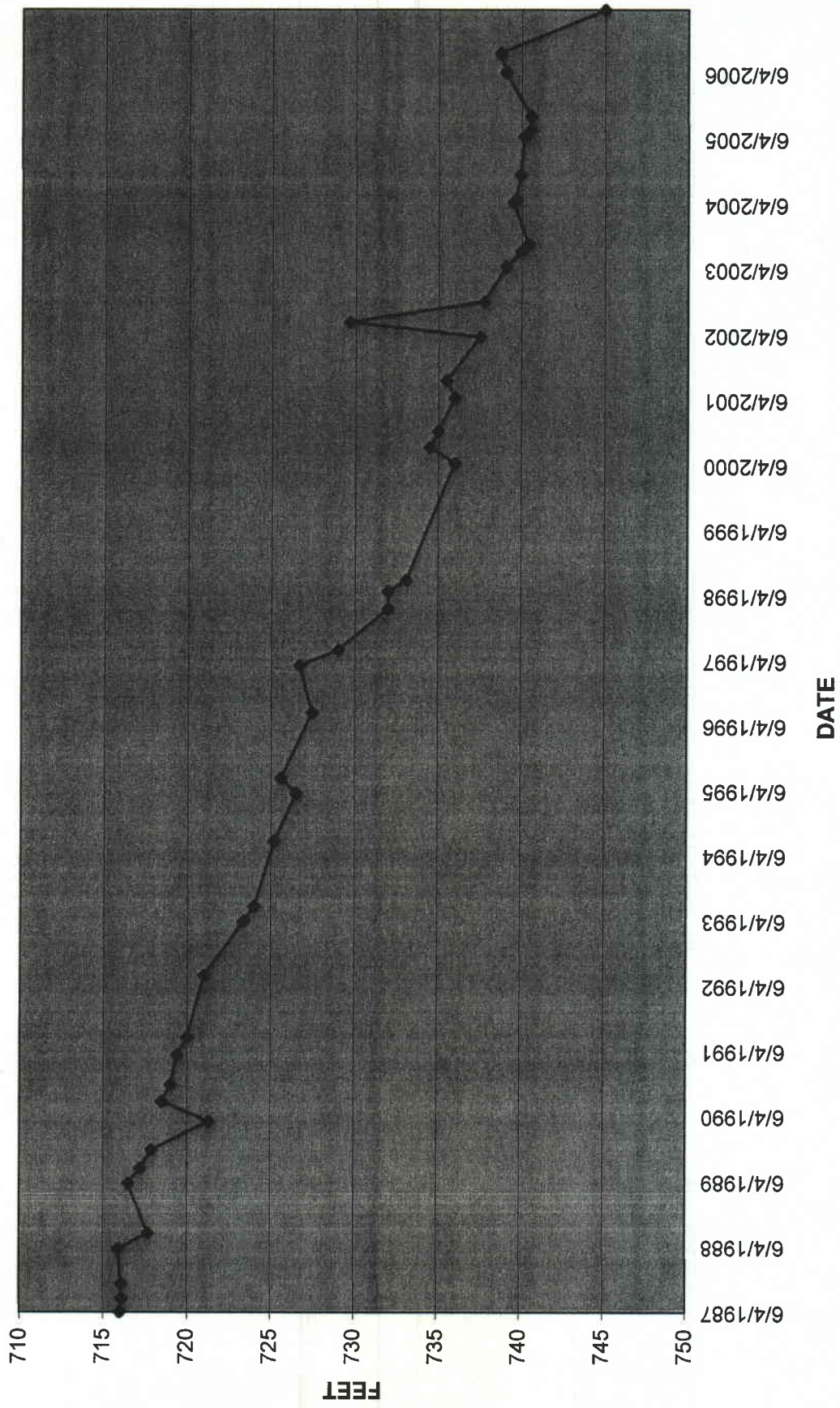
Palmer Hydrologic Drought Index, Region 6 and 7, 1991-2006  
Well Water Level Graphs for Dugout Canyon Mine

PALMER HYDROLOGIC DROUGHT INDEX  
REGION 6 AND 7  
1991 - 2006



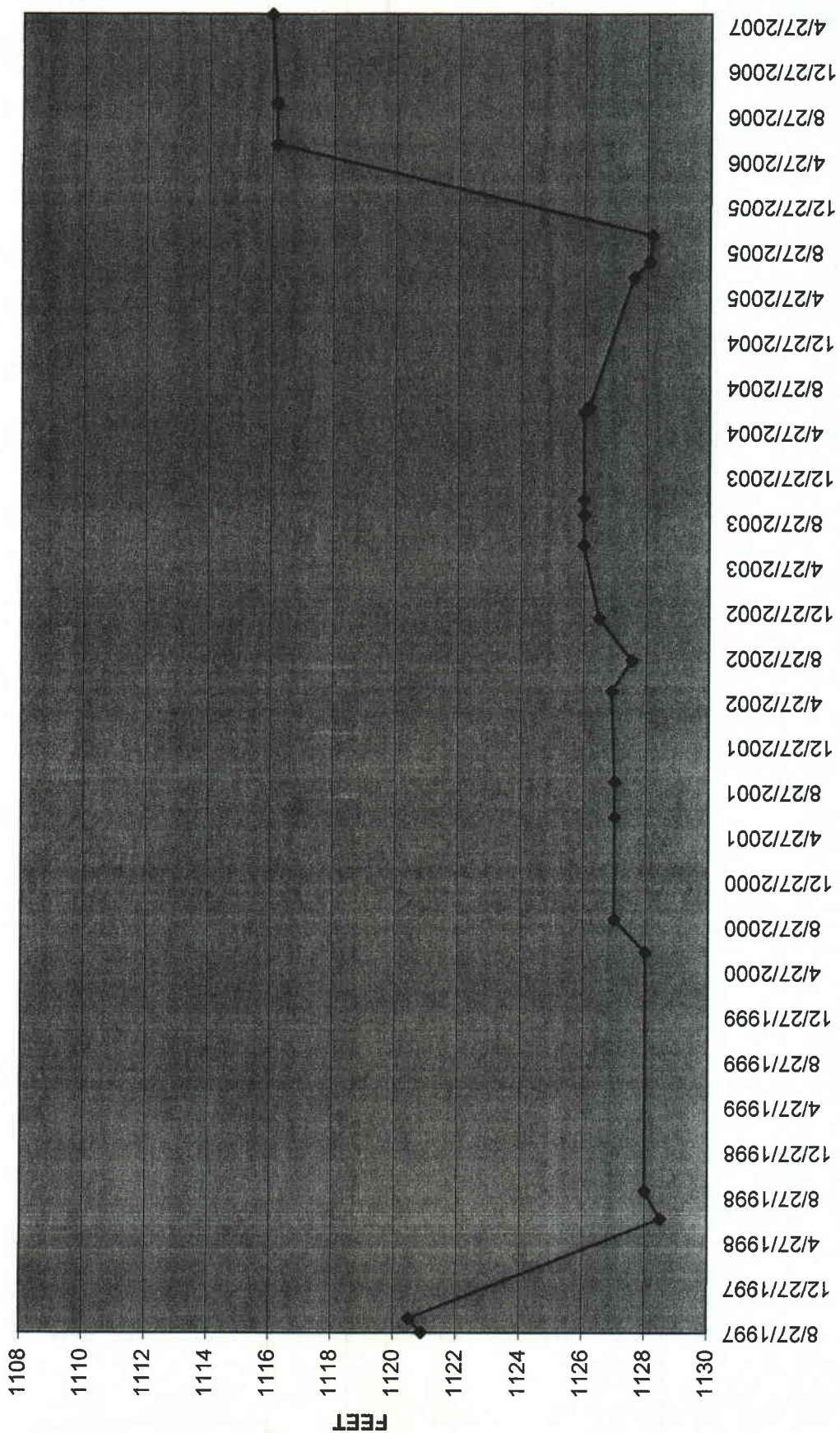


# Well GW-10-2



# Well GW-11-2

DATE

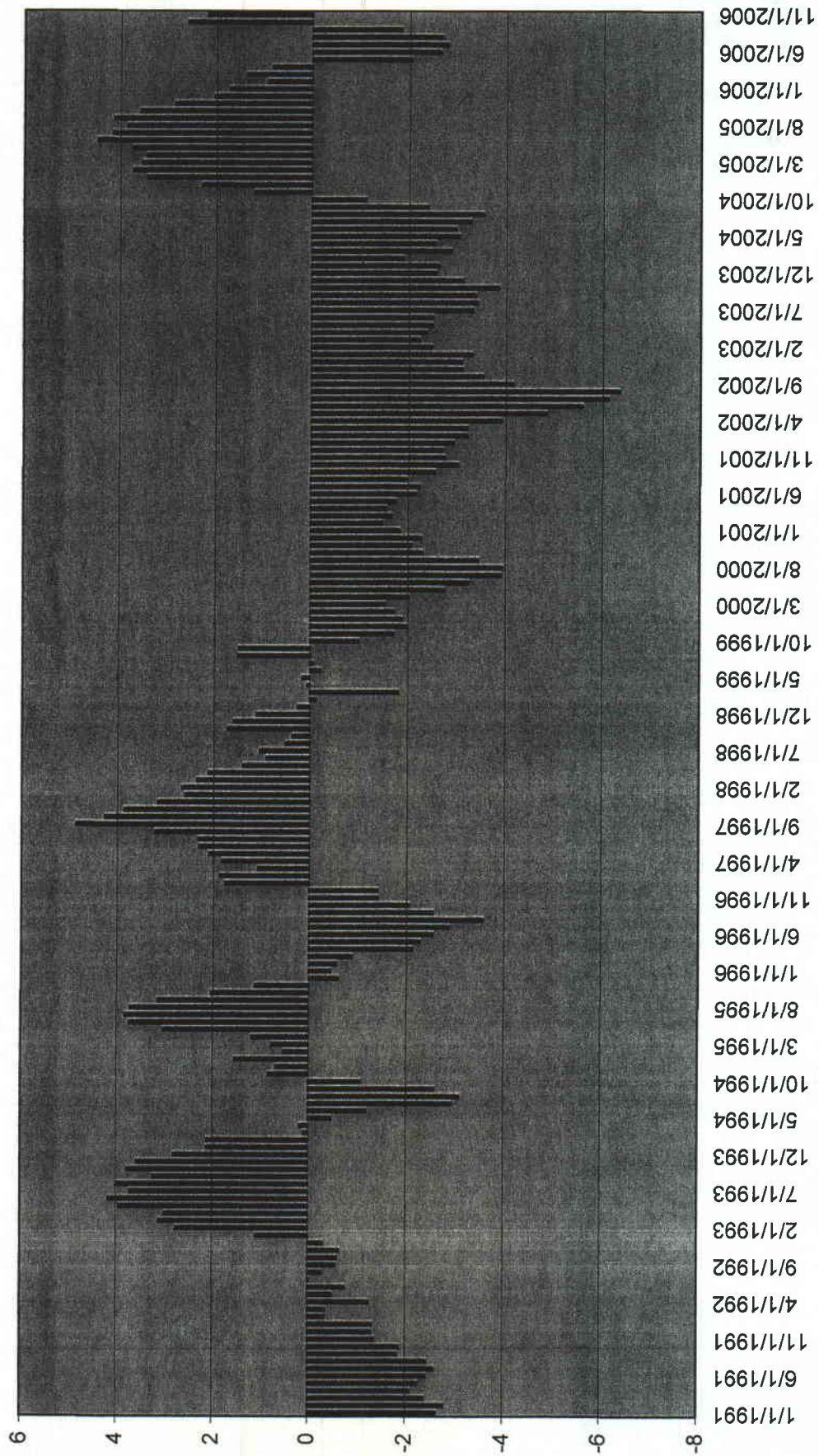




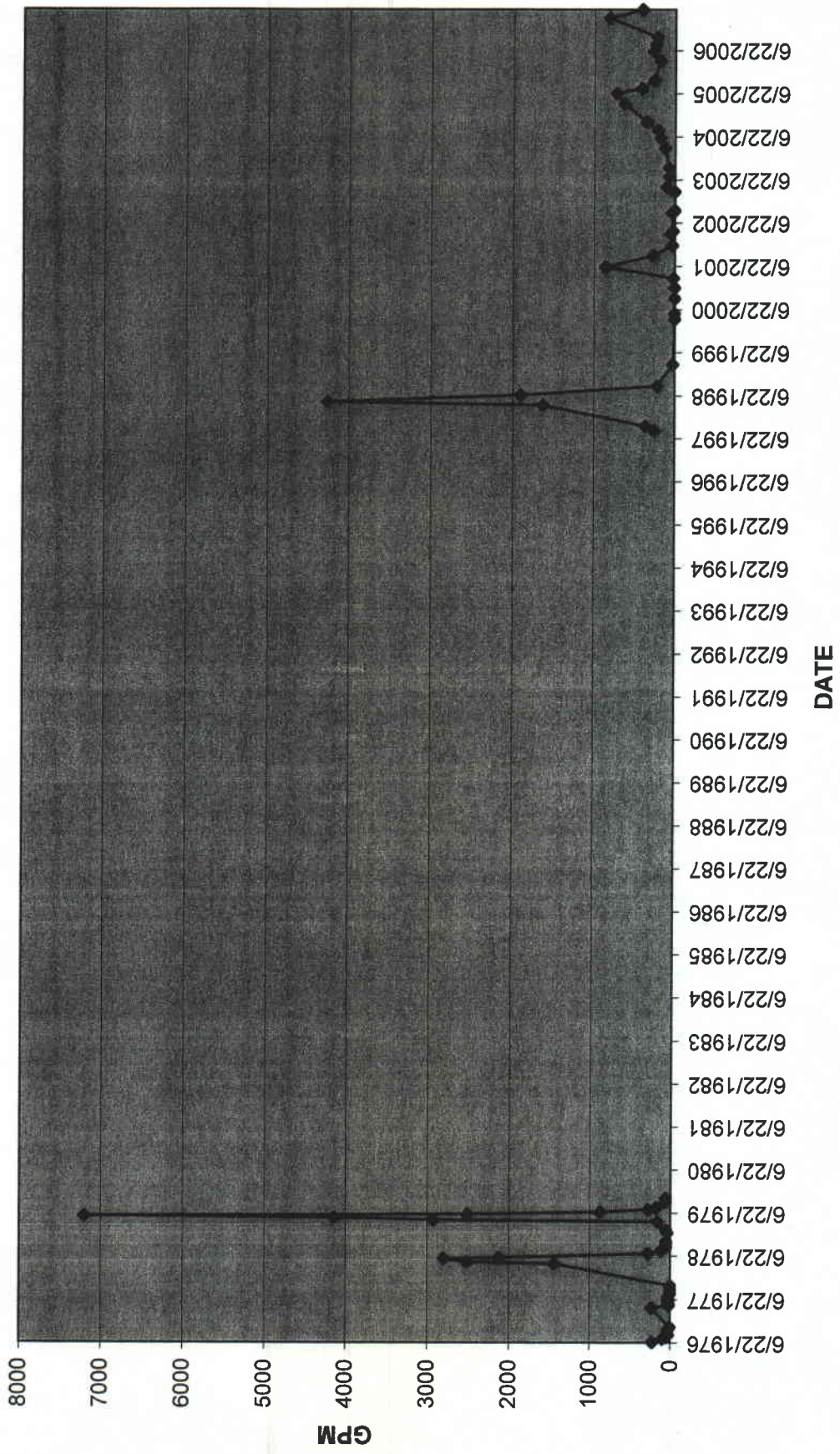
**ATTACHMENT 4**

Palmer Hydrologic Drought Index, Region 6 and 7, 1991-2006  
Surface Water Flow Graphs for Dugout Canyon Mine Sites

**PALMER HYDROLOGIC DROUGHT INDEX  
REGION 6 AND 7  
1991 - 2006**

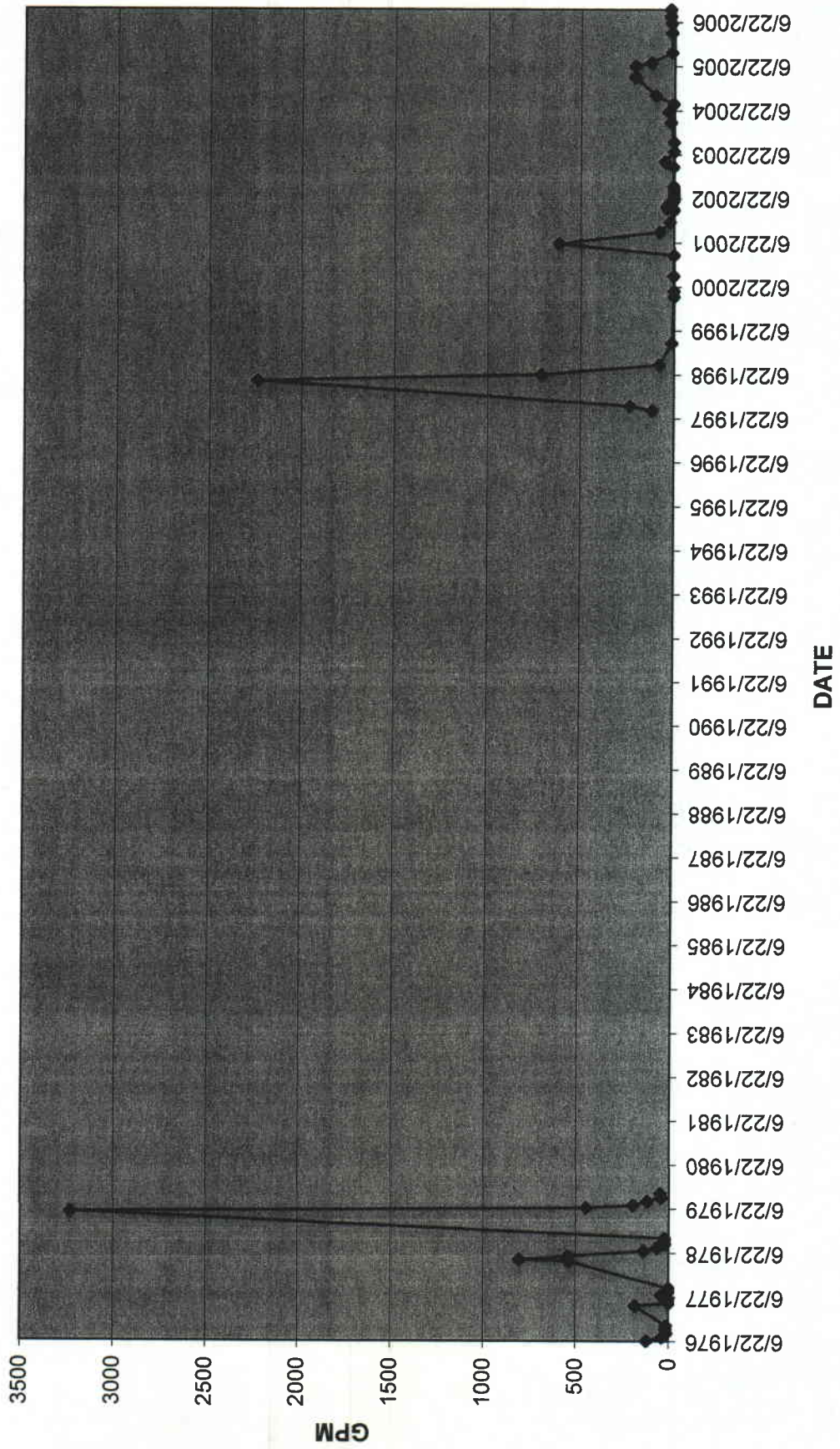


# Dugout Creek Flow DC-1

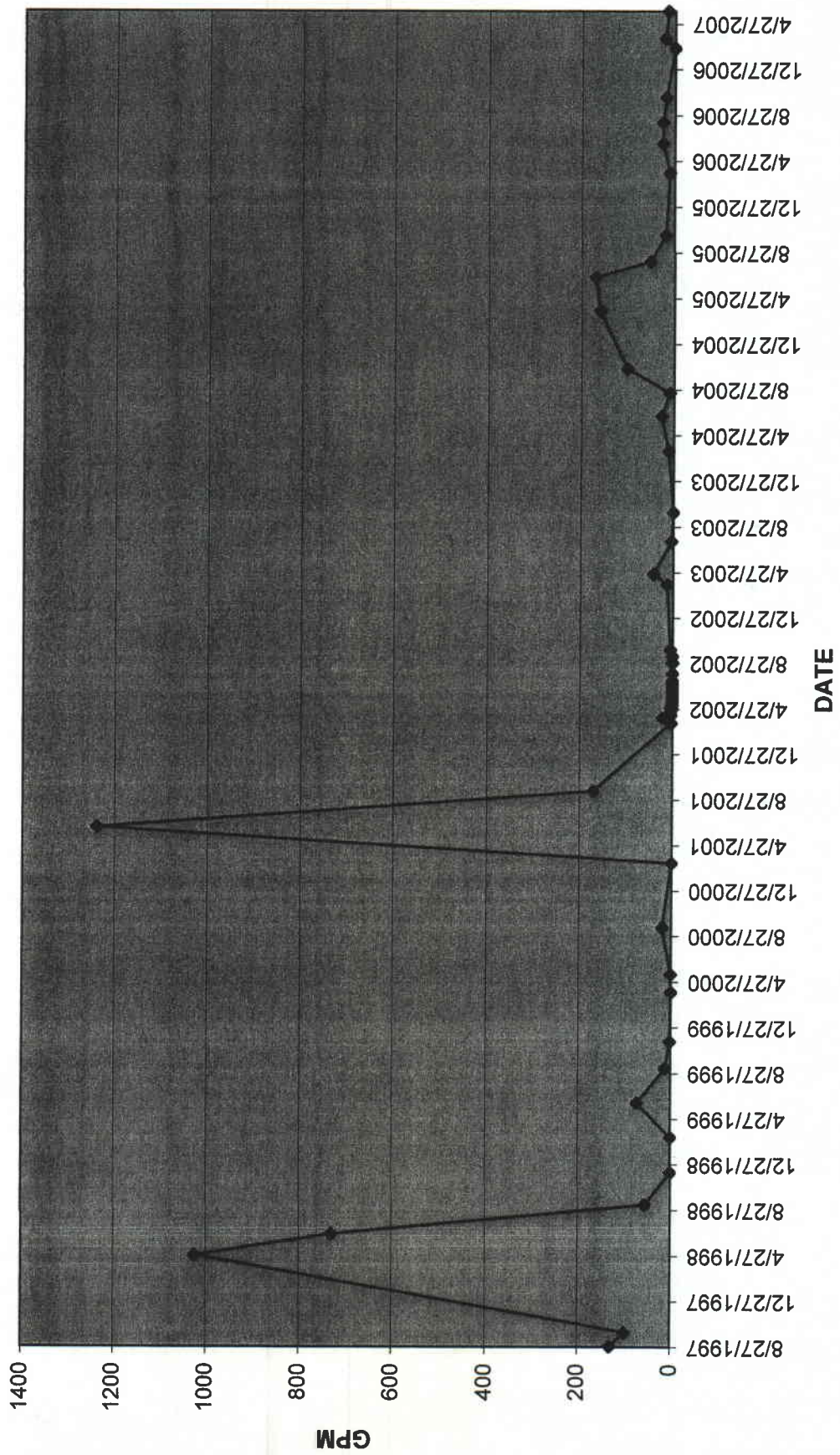




Dugout Creek Flow - Left Fork  
DC-2

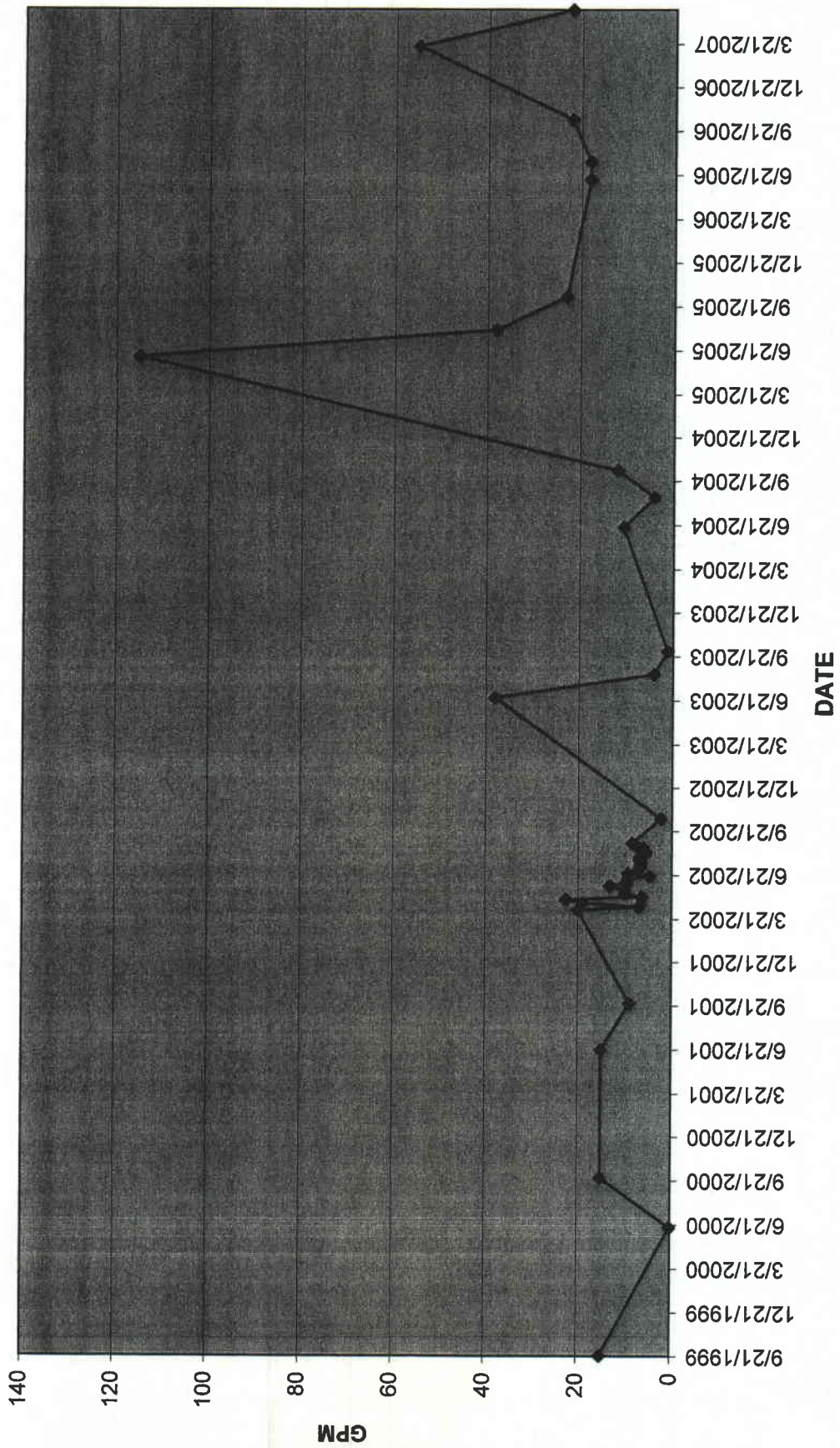


Dugout Creek Flow - Right Fork  
DC-3

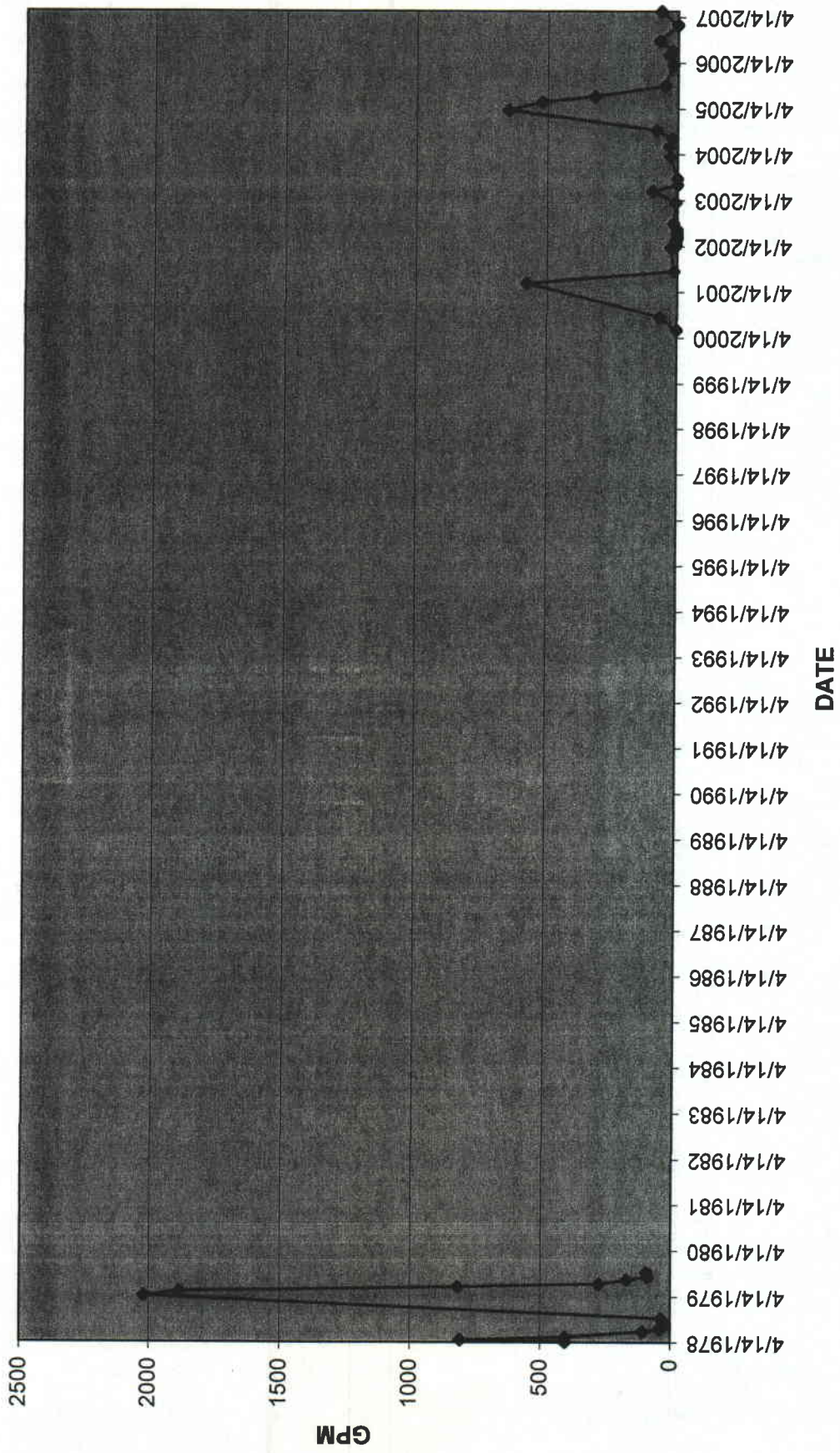




Pace Creek Flow  
PC-1A



Pace Creek Flow  
PC-2





# Rock Creek Flow RC-1

